Project AEIOU's Arts for Learning (A4L) Lessons Program

Year 3 Report on Student Impacts

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Introduction

The Charleston County School District (CCSD), the second largest school system in South Carolina, in partnership with Young Audiences (YA), Inc. implemented *Project Arts-Enhanced Instruction to Optimize Understanding (AEIOU)* of which the *Arts for Learning (A4L) Lessons* is a key program component. A4L Lessons is an intervention intended to improve students' academic achievement through the integration of arts into the language arts curriculum in grades 3 - 5. *Project AEIOU* was funded through a Professional Development for Arts Educators (PDAE) Grant awarded by the Office of Innovation and Improvement (OII) of the U.S. Department of Education.

The A4L Lessons supplemental literacy curriculum was designed by Young Audiences, Inc. in partnership with researchers at the University of Washington, led by cognitive scientist, Dr. John Bransford. A4L Lessons blend the creativity and discipline of the arts with learning science to raise student achievement in reading and writing, as well as to develop learning and life skills. The "How People Learn" framework (Bransford, Brown, & Cocking, 1999) serves as the foundation for the program's pedagogy and strategies for student engagement. It emphasizes teacher-guided, student-initiated activities, encourages students to think and learn independently, and provides tools and strategies to help students approach challenging schoolwork. The arts-integrated curriculum provides students opportunities to excel in the classroom through activities that tap into a wide variety of skill sets and learning styles.

The A4L Lessons program involves the integration of reading, writing, and the arts with exposure to a variety of art forms and literary genres. Students in the treatment group receive two A4L Lessons Units and one teaching artist Residency each school year. The two main elements of the program are (1) A4L Units of instruction, which are delivered by a classroom teacher trained by program staff, focus on a particular art form (i.e., theater, visual arts, music or dance), and are built around one or more central texts; and (2) Residencies aligned with each A4L Unit, in which a trained teaching artist works in collaboration with the classroom teacher during five one-hour sessions. Each A4L Unit is comprised of 10 to 19 Lessons, with the suggested instructional time for the Units varying from 13 to 20 hours. In addition, the Residencies provide more concentrated focus on the study and direct experience of an art form, while also extending and reinforcing the literacy learning of the aligned Unit. Students work together in groups and practice public presentations. The A4L Lessons place an emphasis on students practicing what have been called "21st century skills" such as critical thinking, creative problem solving, and life skills, such as planning and working as a team (Seidel, Tishman, Winner, Hetland & Palmer, 2009; Silva, 2008).

As part of the PDAE Grant, WestEd evaluated the impact of *Project AEIOU's* implementation of the A4L Lessons supplemental literacy curriculum on students' English language arts, writing, and mathematics achievement. A quasi-experimental design (QED) was employed, in which four elementary schools were selected to receive the A4L Lessons (treatment condition), while eight "matched" elementary schools received their status-quo literacy instruction (comparison condition).

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Methodology

The Evaluation Research Program (ERP) at WestEd, an educational research, development and service organization, served as the *Project Arts-Enhanced Instruction to Optimize Understanding (AEIOU)* evaluator. Overall, WestEd's external evaluation consisted of both formative and summative evaluation components and employed a multi-method approach, collecting and analyzing quantitative and qualitative data from a variety of sources.

Throughout the third project year, formative evaluation reports of findings from classroom observations, teacher online surveys, teacher content knowledge assessments, and the report on student impacts associated with the second year of the project were disseminated to the project team in the CCSD to enhance program development and implementation, as well as were included (as appropriate) in reports to the U.S. Department of Education. *This report focuses on the student impacts associated with the 2013-2014 implementation of the Arts for Learning (A4L) supplemental literacy curriculum, a major component of Project AEIOU.*

The summative evaluation employed a quasi-experimental matched comparison study to assess the effectiveness of *Project AEIOU* on student literacy achievement in grades 3 through 5. The summative evaluation was guided by the following research questions:

1. What is the impact of *Project AEIOU* on English language arts achievement as measured by the Palmetto Assessment of State Standards (PASS) English language arts, writing, and mathematics tests and the Comprehensive Cross Unit (CCU) Assessments?

   a. Does increased dosage yield greater achievement gains?

   b. Do some subpopulations of students benefit more from A4L Lessons than others (e.g., English language learners (ELLs), students below grade level on tests of reading proficiency)?

2. What is the impact of *Project AEIOU* on and the Comprehensive Cross Unit (CCU) Assessments?

   a. Do some subpopulations of students benefit more from A4L Lessons than others (e.g., English language learners (ELLs), students below grade level on tests of reading proficiency)?

Well-designed quasi-experimental studies allow strong inferences to be drawn concerning the effectiveness of programs (Cook, Shadish, and Wong, 2008). Quasi-experiments do not use the random assignment of participants to intervention and control groups, but instead depend on

applying appropriate measurement and statistical controls to nonequivalent groups to determine intervention impacts on the outcomes of interest.

The research design included two conditions: (1) an A4L Lessons treatment group comprised of four elementary schools, grades 3 - 5; and (2) a no treatment comparison group comprised of eight elementary schools, grades 3 - 5. Cluster analysis was used to select schools in the comparison condition from among a pool of 27 Title I schools in the CCSD.

The sections that follow describe the school sample selection and matching procedure, as well as the measures used in the analyses to determine student impacts.

SELECTION OF MATCHED COMPARISON SCHOOLS

WestEd employed a cluster analysis procedure to select schools in the comparison condition, given the small number of treatment schools participating in the study. To increase the likelihood of group equivalence on five key predictor (nuisance) variables commonly associated with student achievement, the analysis included the following variables: (1) school enrollment; (2) percentage of students qualifying for free/reduced-price lunch; (3) percentage of special education students; (4) student race/ethnicity (i.e., African American, White, Hispanic, and multiple/other races); and (5) student achievement as measured by the Palmetto Assessment of State Standards (PASS) English language arts (ELA) and mathematics tests administered during the 2011-2012 school year. To enhance statistical power, *stable matched bracketing methodology* was used in which the four treatment schools were matched with eight comparison schools, rather than relying on a one-to-one match. From a pool of 27 Title I schools in the CCSD with 75% or more of their students eligible for free/reduced-price lunch, two matching comparison schools were selected to bracket each treatment school; one that performed slightly above the treatment school and one that fell just below it based on the Mahalanobis distance. Mahalanobis distance is a measure that is used to gauge similarity, in this case among schools, and is based on the correlations among variables (the five listed above) by which different patterns/relationships can be identified. The closer the Mahalanobis distance between schools; the greater the similarity of the schools based on the correlations among variables used in the analysis. Exhibit 1 depicts the group of four treatment schools and eight matched comparison schools participating in the study from among the pool of 27 Title I schools during the first two years of project implementation. During the third and final year of the study one school in the treatment group was closed, Sanders Clyde Elementary School. Frierson Elementary School served as its replacement during the third project year, as well as two comparison schools, Murray Lassiane and Ladson Elementary Schools.

Exhibit 1. Schools in the Treatment and Comparison Groups

School Name	Treatment (Tx) or Comparison (C) School	Mahalanobis Distance
1. Angel Oak Elementary		0.000
2. Lambs Elementary	C	35.170
3. Pinehurst Elementary	Tx	39.308
4. Mitchell Elementary	C	70.610
5. Chicora Elementary	C	73.791
6. Mary Ford Elementary	Tx	82.318
7. Burns Elementary	C	101.435
8. Memminger Elementary		101.899
9. Stono Park Elementary		102.324
10. Hunley Park Elementary	C	116.180
11. Ellington Elementary	Tx	122.975
12. North Charleston Elementary	C	135.535
13. Oakland Elementary	C yr. 1 & 2 only	141.999
14. Sanders Clyde Elementary	Tx yr. 1 & 2 only	148.456
15. St. James-Santee Elementary	C yr. 1 & 2 only	174.311
16. James Simons Elementary		191.262
17. Charleston Progressive Elementary		196.507
18. Blaney Elementary		210.308
19. Pepperhill Elementary		213.776
20. Charleston Development Academy		213.870
21. Minnie Hughes Elementary		217.280
22. Murray Lasaine Elementary	C yr. 3 only	224.068
23. Frierson Elementary	Tx yr.3 only	251.067
24. Ladson Elementary	C yr. 3 only	273.404
25. Jane Edwards Elementary		282.922
26. Corcoran Elementary		284.930
27 Goodwin Elementary		315.264

IDENTIFICATION OF ELIGIBLE STUDENTS

All students in regular third-, fourth-, and fifth-grade classrooms participated in the A4L Lessons program during the 2013-2014 school year. Classroom teachers delivered the intervention in regular classrooms during language arts instructional time. Specifically, one A4L Lessons Unit and one teaching artist Residency was delivered to students in the treatment condition during the 2013-2014 school year. Ten to 19 Lessons comprised each A4L Lessons Unit, with the suggested instructional time for each of the Units varying from 13 to 20 hours.

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STUDENT DEMOGRAPHIC DATA

Data on student demographic characteristics was obtained from the district in October 2012 for the 2011-2012 school year, in August 2013 for the 2012-2013 school year, and in October 2014 for the 2013-2014 school year. Student characteristics included eligibility for free/reduced-price lunch, English language learner (ELL) status, and ethnicity/race (i.e., African American, White, Hispanic and multiple/other races) among other variables. We included these student characteristics in analysis models as covariates to improve the precision of impact estimates. In addition, we used ELL status and below grade-level reading as subgroup indicators in the analyses concerning the differential impacts of the A4L Lessons intervention on student subpopulations.

Data from Frierson Elementary School and its comparison schools for 2013-14 were not included in the analyses reported as students in this treatment school received only one year of the A4L Lessons curriculum (treatment) and teachers received only one year of professional development. In addition, these data were not included in the data file originally provided by the CCSD to WestEd.

PALMETTO ASSESSMENT OF STATE STANDARDS TESTS

The Palmetto Assessment of State Standards (PASS), part of the South Carolina Statewide Assessment Program, is a criterion-referenced test designed to measure mastery of content standards for students in grade levels 3 through 8. Subjects tested include English language arts (ELA), mathematics, and writing for students in grades 3 through 5, although prior to the 2012-2013 school year, only 5th-grade students were administered the PASS writing test. The goal of the A4L Lessons supplemental literacy curriculum is to improve student achievement in the English language arts (ELA), writing, and mathematics making the PASS an appropriate outcome measure aligned with the intervention.

COMPREHENSIVE CROSS-UNIT (CCU) ASSESSMENTS

Students' literacy and life skills were measured by the CCU assessments, which were developed specifically for the A4L Lessons supplemental literacy curriculum by Dr. Diana Sharp and advised by learning and literacy experts at the University of Washington[1]. One such assessment – the Joy Test -- was administered to grade 3 students, while – the Ruth Test -- was administered to students in grade 4, and – the Jackie Test – was administered to students in grade 5. These assessments are constituted by a set of items that focus exclusively on the development of Cross-Unit skills, rather than also including Unit-Specific items. Cross-Unit items assess DEEP skills (Decision Enhanced by

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[1] Literacy expert, Diana Sharp, and learning experts from the University of Washington (UW), John Bransford, Nancy Vye, and Allison Moore developed the assessments. These individuals from UW were also members of the team that developed the curriculum units.

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Empathy and Perspective) and include describing a character's or the author's traits, emotions, thoughts, or internal motivations based on a text, as well as analyzing how a character's or author's perspective impacts other key genre-specific elements (e.g., the problem, events, and resolution in a story; visual representations in a graphic novel; or the mood or feelings in a poem). By contrast, Unit-Specific items assess students' skills specific to an A4L Lessons Unit such as the ability to analyze the structural elements of a story (e.g., protagonist, overarching problems, events, resolution, and setting), make inferences to create meaning, identify the theme in a novel, and identify and describe images from a poem.

Pretest CCU data were collected before the A4L intervention was implemented in treatment schools, while posttest CCU data collection occurred after both A4L Lessons Units and the teaching artist Residency implementation in the spring of each project year (2012, 2013, and 2014).

The CCU assessments ask students to respond to open-ended questions about literature selections and assess literacy achievement, as well as 21st century learning and life skills. Students in intervention schools had no prior exposure to the literature selections or to the CCU assessments through their participation in the A4L Lessons program. The Joy, Ruth, and Jackie CCU assessments are scored with similar rubrics. The rubric for the Joy Test has seven criteria and the Ruth Test and Jackie Test each have 12 criteria. The criteria for the Joy, Ruth, and Jackie Tests are rated using 0 (e.g., *does not make sense*) to 2 (e.g., *mentions what others were thinking*), 0 (e.g., *0 traits*) to 4 (e.g., *4 traits*), 0 to 6, and 0 to 9 scales.

Inter-rater reliability for the CCU assessments has been established, with raters exhibiting high levels of agreement on each item scored (75% agreement or better), although no validation studies have yet been conducted and no parallel forms of the tests are in use.

Findings

The discussion of our findings concerning student impacts is organized by summative evaluation questions and type of assessment. Student impacts on the Palmetto Assessment of State Standards (PASS) tests are presented first, followed by student impacts on the Comprehensive Cross Unit (CCU) assessments.

PALMETTO ASSESSMENT OF STATE STANDARDS (PASS) TEST FINDINGS

SAMPLE

WestEd received a data set from the Charleston County School District (CCSD) containing data for 1,813 students across grades 3 - 5 in 9 schools participating in the study. Student demographic characteristics such as gender, grade level, ethnicity, English language learner (ELL) status, and indicators of student achievement (i.e., the Palmetto Assessment of State Standards (PASS) English language arts (ELA), writing, and mathematics test scores from 2013 and 2014), among other variables were included in the data set. Exhibit 2 lists the treatment and comparison schools, as well as the number of students from each of the schools in our analysis sample. Data from a total of 616 students in grades 3 - 5 from treatment schools who received the A4L Lessons supplemental literacy curriculum and 1,197 students in grades 3-5 from comparison schools were used in the achievement analyses.

Exhibit 2. Number of Students by School

Treatment Schools	Comparison Schools
Ellington Elementary (n = 117)	Burns Elementary (n = 204)
Mary Ford Elementary (n = 134)	Chicora Elementary (n = 199)
Pinehurst Elementary (n = 365)	Hunley Park Elementary (n = 185)
	Lambs Elementary (n = 153)
	Mitchell Elementary (n = 139)
	North Charleston Elementary (n = 317)

Note: As described in an earlier section of this report, the matching procedure relied on cluster analysis and stable matched bracketing methodology to select schools in the comparison condition, resulting in the identification of six comparison schools. We could not identify school of enrollment for five treatment students in the treatment condition.

ANALYTIC METHODS

We determined the impact of the A4L Lessons program on student achievement in English language arts, writing, and mathematics on the Palmetto Assessment of State Standards (PASS) by conducting within-grade comparisons of treatment and comparison group students in grades 3, 4, and 5. The analysis of student achievement data relied on Analysis of Covariance (ANCOVA) modeling

techniques. Using ANCOVA allows one to determine the unique effects of the A4L Lessons program on student achievement once other variables in the model are taken into consideration, as well as to estimate the magnitude of effects (effect size). The effect sizes were computed based on Hedges' g measure. These analyses included all treatment and comparison students, regardless of the extent to which they participated in the program, with separate models conducted for each grade level. Exhibit 3 below provides a brief description of the variables used in the achievement analyses.

Exhibit 3. Description of Variables Used in the Achievement Analyses

Variable	Description
Independent Variables	
Gender	Female = 0, Male = 1
Special Education	Special education = 1, Non-special education = 2. (Identified as having a specific learning disability, mentally retarded, hard of hearing, speech or language impaired, emotional disturbed, orthopedic impaired, or having other health impairments)
English Language Learner	English learners = 1, native English/English proficient students = 0
African American	African American = 1, Non-African American = 0
Receives Free or Reduced Lunch	Receives free or reduced price lunch = 1, does not receive free or reduced price lunch = 0
504 Plan	504 Plan = 1, does not have a 504 plan = 0
Dependent Variables	
Palmetto Assessment of State Standards (PASS)	Spring 2014 PASS English language arts (ELA), mathematics, and writing assessments (Spring ELA 2014) designed to measure progress towards South Carolina's state-adopted academic content standards. Spring 2013 test scores were used as statistical controls (covariates) in the ELA, mathematics, and writing analyses for 4th and 5th graders. For 3rd graders, no previous test scores were available so 2013 school level mean PASS scale scores from the 3rd grade students were used as controls.

We created dosage groups based how long a student had been enrolled in a school participating in the treatment group in the study. Only students in the 4th and 5th grades during the 2013-14 school year were included in the dosage analyses because only these students had the opportunity to participate in the A4L Lessons program for more than one year. Similarly, the comparison groups included only students in 4th- grade and 5th-grade in those schools that did not receive A4L Lessons instruction. Furthermore, to examine whether exposure to A4L Lessons instruction was related to student achievement, we categorized 4th- and 5th-grade students into three groups: (1) Comparison; (2) 1 year; (3) 2 years; and (4) 2.5 years.

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We used a dummy coding strategy to contrast the low and high dosage students with the comparison students, specifying ANCOVA models to assess the effects of program exposure on the PASS ELA, writing, and mathematics scores after controlling for the variables listed in Exhibit 3.

In addition, we conducted exploratory subpopulation analyses to calculate impact estimates for ELL students and below grade-level readers. These subgroup analyses allowed us to determine whether the impact of the intervention differed for these subgroups of students. To conduct the subgroup analyses, we created subgroup × treatment status interaction terms and included these interaction terms as predictors in the ANCOVA models. Subgroup analyses did not include students eligible for free/reduced price lunch because all schools in the study are Title I schools.

TREATMENT OF MISSING DATA

Because of the relatively small number of students who had missing data, we treated missing data by using listwise deletion, excluding all students who did not have complete data for the analyses that assessed the impact of the program on the Palmetto Assessment of State Standards (PASS) English language arts (ELA) and mathematics tests. In total, 10.0% (n =120) of eligible students were removed from the ELA analyses, 10.3% (n=123) of eligible students were removed from the mathematics analyses, and 11.1% (n=132) of eligible students were removed from the writing analyses when we employed listwise deletion.

PALMETTO ASSESSMENT OF STATE STANDARDS (PASS) ELA TEST FINDINGS

The results of the three ANCOVA models revealed that A4L Lessons instruction had a positive, reliable impact on PASS ELA scores for students in grades 3, 4, and 5, although effect sizes for these within-grade comparisons were small. These findings are displayed in Exhibit 4.

Exhibit 4. Means and ANCOVA Results on the 2013 PASS ELA Test for Treatment and Comparison Students

	N	Adjusted Means		F	p-value	Effect Size
		Comparison	Treatment			
Grade 3*	588	613.63	629.74	15.21	.001	0.322
Grade 4	554	607.21	617.48	14.48	.001	0.263
Grade 5	522	612.83	619.66	5.057	.025	0.151

*2013 school level mean 3rd-grade ELA scale scores were used as covariates.

PALMETTO ASSESSMENT OF STATE STANDARDS (PASS) MATHEMATICS TEST FINDINGS

The A4L Lessons program produced a positive impact on PASS mathematics scores for students in grades 4 and 5. The results of ANCOVA modeling showed that after controlling for important covariates, there were significant differences between the PASS mathematics scores of 4th-grade and 5th-grade treatment and comparison students. Grade 4 and grade 5 students who received A4L

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Lessons instruction scored significantly higher on the 2014 PASS mathematics test than did their counterparts in comparison schools; however, the effect sizes for the comparisons were small. Regarding students in grade 3, no significant difference on the PASS mathematics test was evident between treatment and comparison group students. These findings are depicted in Exhibit 5 below.

Exhibit 5. Means and ANCOVA Results on the 2013 PASS Mathematics Test for Treatment and Comparison Students

	N	Adjusted Means		F	p-value	Effect Size
		Comparison	Treatment			
Grade 3*	590	605.67	611.79	1.499	0.220	0.113
Grade 4	554	608.98	623.51	22.69	0.001	0.307
Grade 5	522	612.41	619.44	4.90	0.027	0.141

*2013 school level mean 3rd-grade math scale scores were used as covariates.

PALMETTO ASSESSMENT OF STATE STANDARDS (PASS) WRITING TEST FINDINGS

We conducted a set of analyses to determine whether the A4L Lessons program had an impact on students' writing scores after controlling for other important covariates. As displayed in Exhibit 6, there were no reliable differences between the writing scores of students in treatment schools and their counterparts in comparison schools for students in grades 3, 4, or 5.

Exhibit 6. Means and ANCOVA results on the PASS Writing Test for Treatment and Comparison Students

	N	Adjusted Means		F	p-value	Effect Size
		Comparison	Treatment			
Grade 3*	579	608.15	611.01	0.65	0.422	0.071
Grade 4	543	606.43	610.52	2.42	0.121	0.107
Grade 5	512	616.81	614.12	0.93	0.333	0.064

*2013 school level mean 3rd Grade Writing scale scores were used as controls.

EFFECTS OF PROGRAM EXPOSURE (DOSAGE)

Results of analyses conducted to assess the effects of program exposure or dosage on PASS ELA, mathematics, and writing scores for students in grades 4 and 5 are depicted in Exhibit 7.

GRADE 4 DOSAGE ANALYSIS

Students in grade 4 receiving 2 years of A4L Lessons (treatment) scored reliably higher on the PASS ELA and mathematics tests than students in the comparison group, although effect sizes based on these differences were small. Similarly, 4th-grade students receiving one year of A4L Lessons

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(treatment) also evidenced higher PASS ELA and mathematics scores than 4th graders in the comparison condition, but these differences were not statistically significant. Grade 4 students receiving one year of treatment (1 year of dosage and, therefore, not in the sample the previous year) scored reliably higher on the PASS writing test than students in the comparison group, although the effect size was small. Surprisingly, grade 4 students receiving two years of treatment (2 years of dosage) did not demonstrate reliably greater differences on PASS writing test scores than grade 4 comparison students.

GRADE 5 DOSAGE

Grade 5 students receiving at least two years of A4L Lessons instruction scored reliably higher on the PASS ELA test than their comparison group counterparts and the effect size was small. There was no significant difference between students receiving one year of dosage and comparison group students, although means were in the expected direction.

Similarly, grade 5 students receiving 2.5 years of A4L Lessons instruction scored reliably higher on the PASS ELA test than their comparison group counterparts, although the effect size was small. In addition, grade 5 students receiving one or two years of dosage evidenced higher PASS mathematics scores than grade 5 comparison group students, but these differences were not statistically significant.

No reliable differences were found between 5th-grade students in treatment and comparison groups on the PASS writing test, regardless of the level of dosage (i.e., 1, 2, or 2.5 years).

Exhibit 7. Differences between Students in Comparison Group and Students in Treatment Groups

	Comparison Group	1 Year Dosage Treatment Group			2 Years Dosage Treatment Group			2.5 Years Dosage Treatment Group		
	Adjusted Means	Adjusted Means	p-value	Effect Size	Adjusted Means	p-value	Effect Size	Adjusted Means	p-value	Effect Size
Grade 4										
PASS ELA	607.41	611.69	0.538	0.11	618.04	0.001	0.27	-	-	-
PASS Math	609.57	621.61	0.123	0.03	622.69	0.000	0.28	-	-	-
PASS Writing	606.72	629.87	0.001	0.06	608.05	0.632	0.04	-	-	-
Grade 5										
PASS ELA	613.39	606.94	0.486	0.14	631.68	0.006	0.39	620.09	0.050	0.15
PASS Math	612.50	612.93	0.965	0.01	622.32	0.162	0.19	621.20	0.017	0.17
PASS Writing	617.26	612.51	0.590	0.11	620.35	0.621	0.07	613.20	0.201	0.10

* Grade 4: Comparison n = 411; 1 Year n = 31; 2 Years n = 160. Grade 5: Comparison n = 376; 1 Year n = 23; 2 Years n = 23, 2.5 Years n = 121. The means have been adjusted to account for the covariates in the models. The effect sizes were calculated by dividing the mean difference by the pooled standard deviation. The effect sizes and p values are based on contrasts between treatment and comparison students across three dosage levels.

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SAMPLE

Comprehensive Cross Unit (CCU) assessment data were analyzed for 488 students in grades 3, 4, and 5 who received A4L Lessons instruction. Exhibit 8 depicts the number of students with matching CCU pretests/posttests collected at each of the elementary schools in the treatment condition. It should be noted that CCU assessments were not administered in comparison schools.

Exhibit 8. Number of Students by Treatment School

Treatment School	Number
Pinehurst Elementary	283
Mary Ford Elementary	100
Ellington Elementary	100
Frierson Elementary	0

Note: We could not identify school of enrollment for five students in the treatment condition.

As can be seen in Exhibit 9, student demographics such as gender, English language learner (ELL) status, and ethnicity were similarly distributed across grade levels in treatment schools.

Exhibit 9. Student Demographic Characteristics by Grade Level

	3rd Grade (n = 191)[2]	4th Grade (n = 153)	5th Grade (n = 141)
Female	47%	50%	44%
Special Education	9%	7%	8%
English Language Learner	40%	41%	31%
African American	50%	51%	57%
Receives Free or Reduced Lunch	96%	97%	97%
Below reading grade level	42%	39%	62%
504 Plan	2%	1%	2%

ANALYTIC METHODS

We determined the impact of the A4L Lessons on student literacy for students in the treatment condition, relying on Student's t statistic and using paired samples to compare pretest/posttest mean scores on the CCU assessments. Analyses were conducted within grade levels 3, 4, and 5. In

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[2] Demographic characteristics were not available for two 3rd grade students and one 4th grade student.

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addition, exploratory analyses assessing the impact of A4L Lessons instruction on student subpopulations (i.e., ELL students and below grade-level readers) were conducted.

Regarding CCU assessments, 3rd-grade students were administered the Joy Test, 4th- grade students were administered the Ruth Test, and 5th-grade students were administered the Jackie Test. Findings are reported below by grade level and CCU assessment (Joy, Ruth, or Jackie Test).

GRADE 3: JOY TEST FINDINGS

On average, students in grade 3 evidenced reliable gains in their literacy learning as measured by the Comprehensive Cross Unit (CCU) assessment (Joy Test). Statistically significant gains from pretest to posttest were evident at the $p<.001$ level. These findings are depicted in Exhibit 10.

Exhibit 10. Literacy Gains on the Joy Test: Grade 3 Treatment Students

Mean Pretest	Mean Posttest	t	p-value
10.32	12.81	-5.68	.001

In addition, we determined the percentage of students in grade 3 making gains or improving from pretest to posttest on the Joy Test. As can be seen in Exhibit 11, a majority (64.1%) of 3rd-grade students evidenced some degree of improvement from pretest to posttest.

Exhibit 11. Improvement on the Joy Test: Grade 3 Treatment Students

Improvement	Percent	Number
Improved	64.1	123
No change	5.7	11
Did not improve	30.2	58

GRADES 4: RUTH TEST FINDINGS

Similarly, students in grade 4 receiving the A4L supplemental curriculum evidenced reliable gains in their literacy learning. Statistically significant differences were apparent from pretest to posttest on the Ruth Test at the $p<.001$ level. These findings are displayed in Exhibit 12.

Exhibit 12. Literacy Gains on the Ruth Test: Grade 4 Treatment Students

Mean Pretest	Mean Posttest	t	p-value
15.56	19.90	-8.17	.001

In addition, we determined the percentage of students in grade 4 making gains or improving from pretest to posttest on the Ruth Test. As can be seen in Exhibit 13, a sizeable majority (73.7%) of 4th-grade students evidenced some degree of improvement from pretest to posttest.

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Exhibit 13. Improvement on the Ruth Test: Grade 4 Treatment Students

Improvement	Percent	Number
Improved	73.7	112
No change	4.6	7
Did not improve	21.7	33

GRADES 5: JACKIE TEST FINDINGS

As with students in grades 3 and 4, students in grade 5 receiving the A4L supplemental literacy curriculum demonstrated reliable gains in their literacy learning as assessed on the Jackie Test (p<.001). These findings are displayed in Exhibit 14.

Exhibit 14. Literacy Gains on the Jackie Test: Grade 5 Treatment Students

Mean Pretest	Mean Posttest	t	p-value
14.07	17.17	-5.87	.001

We also determined the percentage of students in grade 5 making gains or improving from pretest to posttest on the Jackie Test. As can be seen in Exhibit 15, a majority (59.7%) of 5th-grade students evidenced some degree of improvement from pretest to posttest.

Exhibit 15. Improvement on the Jackie Test: Grade 5 Treatment Students

Improvement	Percent	Number
Improved	59.7	86
No change	11.1	16
Did not improve	29.2	42

SUBPOPULATION FINDINGS

In addition to the within-grade comparisons presented above, we conducted analyses to determine whether the impact of the A4L Lessons instruction differed for certain subpopulations of students. Specifically, we assessed whether the impact of the A4L Lessons intervention was stronger for ELL students and students reading below grade-level.

ENGLISH LANGUAGE LEARNERS

Overall, ELL students in grades 4 and 5 demonstrated greater gains than non-ELL students in grades 4 and 5 on the CCU assessments, although these gains were not statistically significant. In contrast, 3rd -grade non-ELL students made greater gains than 3rd-grade ELL students as measured

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by the Joy Test; however, these gains were not statistically significant (F (1,188) = 1.695, p > .05). These findings are depicted in Exhibit 16.

Exhibit 16. Literacy Gains for English Language Learners on the Joy Test

ELL status	Number	Mean Gain
Non-English language learners	114	2.11
English language learners	76	3.28

Grade 4 ELL students evidenced greater gains than 4th-grade non-ELL students on the Ruth Test as shown in Exhibit 17, however, these gains did not achieve statistical significance (F (1, 149) = 0.047, p > .05).

Exhibit 17. Literacy Gains for English Language Learners on the Ruth Test

| ELL status	Number	Mean Gain
Non English Language learners	89	4.28
English Language learners	62	4.51

Similarly, 5th-grade ELL students evidenced greater gains than 5th-grade non-ELL students on the Ruth Test as shown in Exhibit 18, although these gains were not statistically significant (F (1, 142) = 1.315, p > .01).

Exhibit 18. Literacy Gains for English Language Learners on the Jackie Test

ELL status	Number	Mean Gain
Non English Language learners	101	2.70
English Language learners	43	4.02

Further analyses showed that a larger percentage of ELL students made improvement on the CCU assessments than non-ELL students. Analyses revealed that 63.2% of 3rd-grade non-ELL students evidenced some degree of improvement on the CCU compared to 67.1% of 3rd-grade ELL students. In contrast, 73.0% of 4th-grade and 55.4% of 5th-grade non-ELL students evidenced some degree of improvement on the CCU Test compared to 75.8% of 4th- grade and 69.8% of 5th-grade ELL students. These findings are depicted in Exhibit 19.

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Exhibit 19. CCU Test Improvements by ELL status
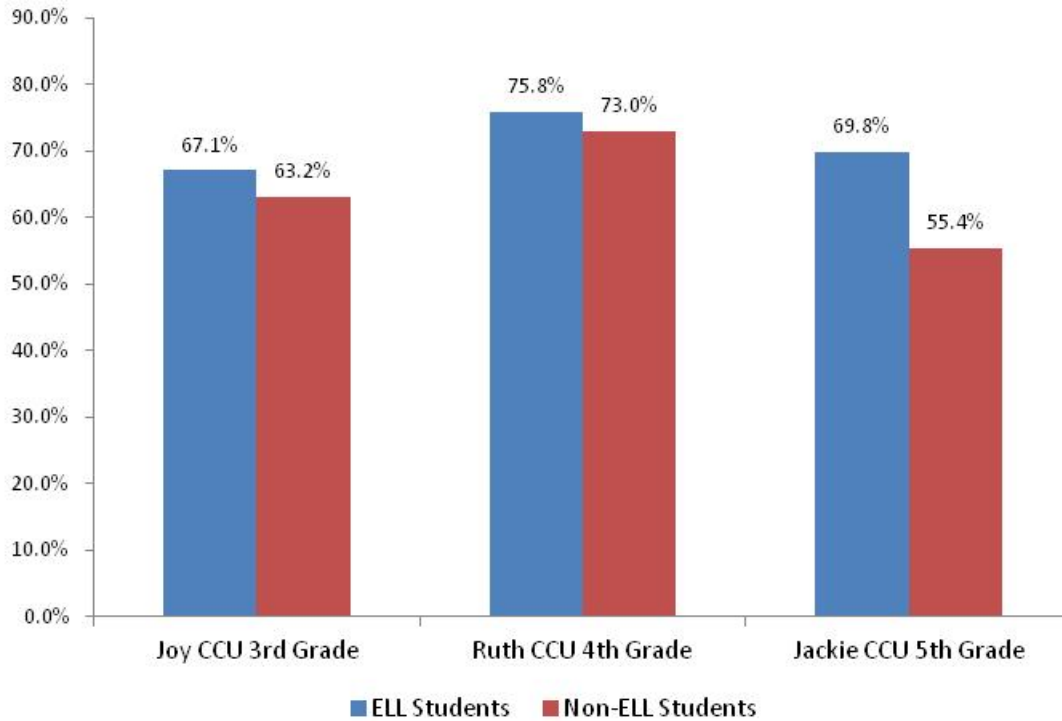
READING LEVEL

Analyses comparing the CCU gain scores of students reading below, at, or above grade level found no reliable differences among these subgroups of students.

For 3rd-grade students, no reliable differences were found between pretest and posttest on the Joy Test (F (2, 187) = 1.041, p > .05). Mean gain scores by reading level are displayed in Exhibit 20 for treatment students in grade 3.

Exhibit 20. Literacy Gains by Reading Level for Grade 3 Treatment Students

Reading Level	Number	Mean Gain
Below grade level	81	2.46
At grade level	54	3.50
Above grade level	55	1.85

Similarly, no reliable differences between pretest and posttest were found on the Ruth Test between reading levels for 4th- graders (F (2, 145) = 0.500, p > .05) or on the Jackie Test for 5th-graders (F (2, 141) = 0.731, p > .05). These findings are depicted in Exhibits 21 and 21, respectively.

Exhibit 21. Literacy Gains by Reading Level for Grade 4 Treatment Students

Reading Level	Number	Mean Gain
Below grade level	59	5.02
At grade level	56	3.84
Above grade level	33	4.09

Exhibit 22. Literacy Gains by Reading Level for Grade 5 Treatment Students

Reading Level	Number	Mean Gain
Below grade level	87	3.57
At grade level	21	1.86
Above grade level	36	2.67

In addition, we determined the percentage of students in grades 3, 4 and 5 making some degree of improvement from pretest to posttest. A slightly larger percentage of 3rd-grade students reading at grade level made improvement (68.5%) on the CCU than did students reading above (63.6%) or below (63.0%) grade level. However, this pattern of findings differed for grade 4 students and grade 5 students. For grade 4 students, a slightly larger percentage of those reading below grade level showed improvement (76.3%) as assessed by the CCU than those reading above (75.8%) or at (71.4%) grade level. Similar to 4th grade findings, grade 5 students reading below grade level made the most improvement on the CCU assessment (64.4%) compared to grade-level readers (52.4%) and those reading above grade level (52.8). Exhibit 23 displays the improvement as assessed on the CCU by student reading level.

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Exhibit 23. CCU Test Improvements by Reading Level
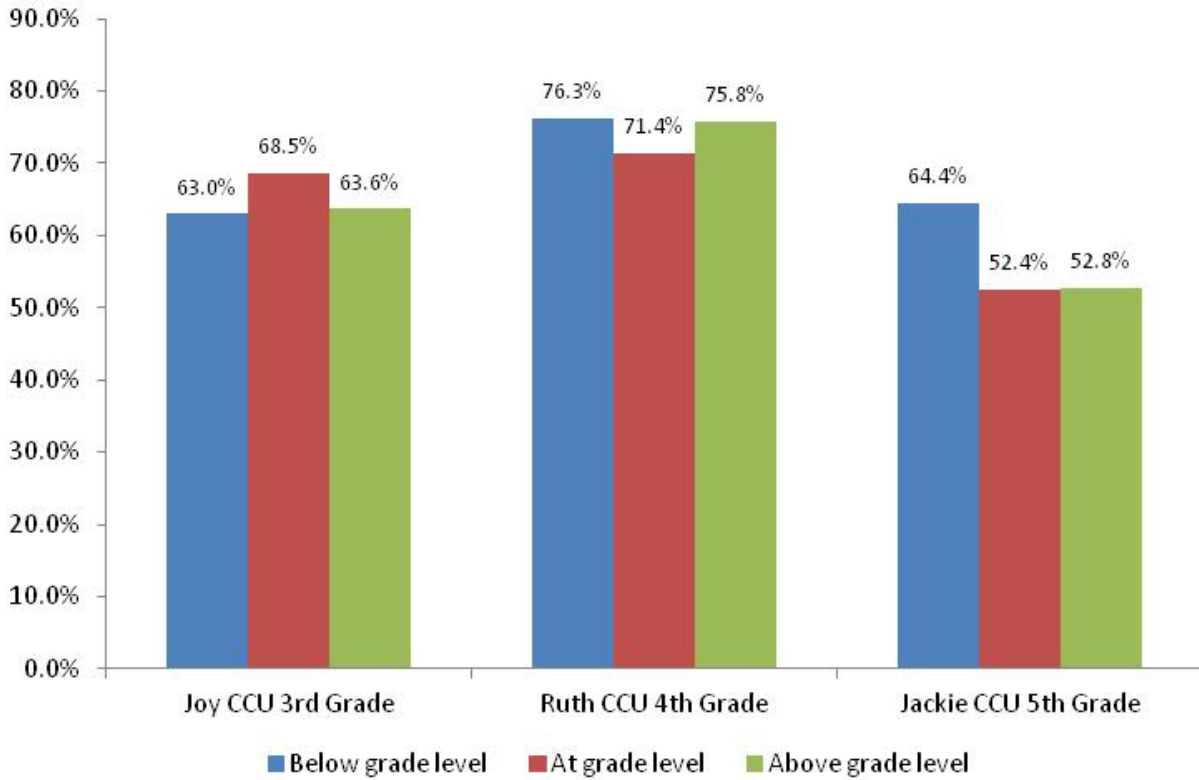
Summary of Findings

The Charleston County School District implemented the *Arts for Learning (A4L) Lessons* supplemental literacy curriculum, a key component of the district's *Project Arts-Enhanced Instruction to Optimize Understanding (AEIOU)*. The A4L Lessons program is an intervention intended to improve student literacy achievement through the integration of the arts into the language arts curriculum in grades 3 through 5. The intervention was delivered during the spring 2012 semester and the 2012-2013 and 2013-2014 school years in four Title I elementary schools in the district. Among our findings for the third year of program implementation were the following:

- The results of three Analysis of Covariance (ANCOVA) models revealed that the A4L Lessons program produced a reliable impact on PASS English language arts scores for students in grades 3, 4 and 5, although effect sizes for these within-grade comparisons were generally small.

- Similarly, the A4L Lessons program produced a positive impact on PASS mathematics test scores for students in grades 4 and 5, however no significant differences emerged between treatment and comparison students in grade 3. The results of ANCOVA modeling showed, that even after controlling for important covariates, reliable differences between students in treatment and comparison conditions were evident for students in grades 4 and 5. Effect sizes, however, were very small.

- There were no reliable differences between treatment and comparison students on the PASS Writing test for grades 3, 4, or 5.

- Analyses were conducted to assess the effects of program exposure or dosage on PASS ELA, mathematics, and writing scores for students in grades 4 and 5. Students in grade 4 receiving two years of A4L Lessons instruction scored reliably higher on the PASS ELA and mathematics tests, although effect sizes were very small. In addition, grade 4 students receiving one year of the A4L Lessons program scored reliably higher than comparison students on the PASS writing test. Similarly grade 5 students receiving two years or more of A4L Lessons instruction scored reliably higher on the PASS ELA test than their comparison group counterparts.

- On average, students in grades 3, 4, and 5 evidenced reliable gains in their literacy learning as measured by the Comprehensive Cross Unit (CCU) assessments. Statistically significant gains from pretest to posttest were evident at the p<.001 level.

- Subpopulation analyses focusing on English language learners (ELL) and students reading below grade level allowed us to determine whether the impact of the A4L Lessons intervention differed for these subgroups. Overall, findings were mixed.

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o Analyses comparing CCU gain scores revealed that 4th- and 5th-grade ELL students made greater gains than 4th- and 5th-grade non-ELL students. In contrast, 3rd-grade non-ELL students made greater gains than ELL students. None of these gains, however, achieved statistical significance.

o Analyses comparing the gain scores of students in grades 3 through 5 on the CCU assessments by reading level evidenced no differences among students reading below, at, or above grade level.

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