

April 2007

# The Hill Center Reading Achievement Program in Durham Public Schools: Final Report

Prepared for

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## EXECUTIVE SUMMARY

This report is an evaluation of the Hill Center Reading Achievement Program (RAP), an initiative of The Hill Center, conducted in collaboration with the North Carolina GlaxoSmithKline Foundation and Durham Public Schools. The Durham Public Schools sought research-based methods that could improve the reading skills of students who do not meet North Carolina state standards for reading proficiency and agreed to partner with The Hill Center in implementation of RAP. The RAP was implemented in selected elementary schools and used The Hill Center's successful, research-based instructional methodology to improve the reading skills of students who do not meet the standards set by the state of North Carolina for reading proficiency.

RTI International provided an independent evaluation of the outcomes of the RAP as it was implemented in selected Durham (public) elementary schools from 2003 to 2006. This report provides the findings of RTI's evaluation of the 3 years of the project.

### ES.1 Key Findings

The purpose of the evaluation is to examine the effectiveness of the instructional methodologies of RAP by specifically addressing the following five questions:

1. What are the outcomes and impacts on students in The Hill Center RAP? Specifically, what effect did RAP have on student achievement in reading, based on nationally norm-based tests and North Carolina End-of-Grade tests?
2. How do the effects of RAP vary across student participants? Specifically, are there differences based on race/ethnicity, free or reduced-lunch eligibility status, identification as Exceptional Children, diagnoses of a learning disability, IQ level, repeating a grade, or English as a second language?
3. How many instructional hours do students receive as part of The Hill Center RAP?
4. What is the average growth per year in the achievement test scores of RAP students?
5. How does the degree of teacher implementation of the program affect the achievement test scores of RAP students?

Overall, the findings show that:

- With 1 year of participation in RAP, Durham Public School students significantly improved their scores on three of four Woodcock Johnson III subtests (national norm-based tests), achieving at levels very close to the average score range for these tests. In addition, students' rates of growth on these tests were significantly faster than the rates of their average-ability peers.
- Despite their continued status as students at risk for failing in reading, students who participated in RAP for a second year achieved the expected amount of growth on three of four Woodcock Johnson III subtests for average-ability students their age. For one subtest, students significantly improved their scores from year 1 to year 2 of

participation in RAP, learning at a faster rate than expected for average children their age.

- Changes in the North Carolina End-of-Grade Reading test scores of third-, fourth-, and fifth-grade students with 1 year of participation in RAP showed significant growth in achievement. Third- and fourth-grade students also showed significant growth in achievement in mathematics, as measured by the North Carolina End-of-Grade Math test scores.
- The numbers of third-, fourth-, and fifth-grade students performing at or above grade level on the North Carolina End-of-Grade Reading test after 1 year of participation in RAP increased significantly.
- Third- and fourth-grade students who participated in RAP for 2 years showed significant improvement in their North Carolina End-of-Grade Reading test scores after their second year of participation.
- Minority students, English as a second language (ESL) students, students identified as Exceptional Children, and students repeating a grade scored statistically significantly lower at baseline on various Woodcock Johnson III subtests relative to their peers. However, analysis of rates of growth in achievement after 1 year of participation in RAP show that ESL students and students repeating a grade had higher gains per instructional hour than their peers.
- The increases in standard scores per instructional hour for three of four Woodcock Johnson III subtests were statistically significant; the increases were .06, .04, and .08 standard score points per instructional hour for the Passage Comprehension, Reading Fluency, and Word Attack subtests, respectively.
- On average, students received 56 hours of instruction with 1 year of participation in RAP and 116 hours of instruction with 2 years. Recommended average hours of instruction are 144 hours with 1 year of participation in RAP and 288 hours with 2 years. Had students received recommended hours of instruction (and assuming growth would be constant or linear across the additional hours), their gains would have doubled on three of the four Woodcock Johnson subtests.
- No statistically significant relationship was found between teachers' level of implementation of RAP and student achievement scores. In part, this finding is likely explained by the fact that within 18 months of their initial participation in training on RAP, the majority of teachers were rated as very proficient or proficient in implementing RAP in their classrooms.

## **ES.2 Summary and Implications**

Generally, the findings from the evaluation of The Hill Center RAP in Durham County show that students who participated in RAP significantly improved not only their reading achievement levels, but also the rate at which they learned relative to their average-ability peers. Changes in scores and achievement growth rates were more pronounced after 1 year of participation in RAP compared with 2 years. In part, this finding may be due to the fact that students participating in RAP for more than 1 year are those who face greater difficulties in becoming successful readers. Another factor may be that the smaller number of students continuing in the RAP program for 2 and 3 years made it difficult to detect changes in student performance.



Many of the students involved in this study were not only at risk for school failure due to a learning disability, but also due to other factors such as low socioeconomic status, low IQ, and previous school failure (i.e., having repeated a grade). While participating in RAP, these students progressed at a rate faster than expected or at the rate expected of an average student for their age. However, these students were not average students: they also faced significant, often multiple, barriers to success. Thus, progressing at a rate faster than expected of an average student is a successful result for them; even progressing at the rate expected of an average student is a successful result. The findings show that during their time in the RAP program, these students did not fall further behind in achievement compared with their peers; they either maintained their achievement level or actually began catching up to their peers. As the children typically selected for this program progress at slower than expected rates, these findings provide support for the hypothesis that RAP helped participating students.



# 1. INTRODUCTION

This report is an evaluation of The Hill Center Reading Achievement Program (RAP), an initiative of The Hill Center, conducted in collaboration with the North Carolina GlaxoSmithKline Foundation and Durham Public Schools. RAP was implemented in selected Durham Public elementary schools from 2003 to 2006, and RTI International evaluated the program as it was implemented in these schools.

The purpose of the evaluation is to examine the effectiveness of the instructional methodologies of RAP by specifically addressing the following five questions:

- What effect did RAP have on student achievement in reading, based on nationally norm-based tests and North Carolina End-of-Grade (EOG) tests?
- How do the effects of RAP vary across student participants? Specifically, are there differences based on race/ethnicity, free or reduced-lunch eligibility status, identification as Exceptional Children, diagnoses of a learning disability, IQ level, repeating a grade, or English as a second language?
- How many instructional hours do students receive as part of The Hill Center RAP?
- What is the average growth per year in the achievement test scores of RAP students?
- How does the degree of teacher implementation of the program affect the achievement test scores of RAP students?

This report is divided into primarily two sections. First, a description of the program and data collection activities is presented, then findings on the effects of The Hill Center RAP on student achievement based on national norm-based tests and the North Carolina EOG tests are presented.

## 1.1 Overview of the Hill Center

The Hill Center, located in Durham, North Carolina, was established in 1977 to provide an intensive remediation program to students with specific learning disabilities or attention deficit disorders. The mission of The Hill Center is to transform students with learning differences into confident independent learners. As a comprehensive resource center, The Hill Center also supports families, offers professional development opportunities, collaborates in clinical research, and promotes community outreach to help students become successful independent learners.

The Hill Center is committed to helping students with learning differences outside the walls of The Hill Center through their outreach programs, which provide professional development for teachers and administrators nationally and internationally. With the support of foundations, individuals, and businesses, The Hill Center has developed best practices professional development workshops and programs, implemented Hill-based programs in public and private school settings and early childhood programs, and provided consultation

to a host of others. Through these efforts, The Hill Center is actively engaged in improving teacher preparation, sharing its successful research-based instructional methodology, and partnering with public and private schools everywhere to help *all* students achieve success in school.

## **1.2 Overview of the Reading Achievement Program Initiative**

RAP is an initiative of The Hill Center, conducted in collaboration with the North Carolina GlaxoSmithKline Foundation and Durham Public Schools. The Durham Public Schools sought research-based methods that could improve the reading skills of students who did not meet the North Carolina state standards for reading proficiency and agreed to partner with The Hill Center in implementation of RAP. The RAP was implemented in selected elementary schools and used The Hill Center's successful, research-based instructional methodology to improve the reading skills of students who do not meet the standards set by the state of North Carolina for reading proficiency.

Durham County is located in central North Carolina, at the tip of the Research Triangle region, centered among the cities of Durham, Chapel Hill, and Raleigh, the state capital. Though once was known for its agricultural and manufacturing economy, Durham County has evolved to achieve world-class status in the areas of medicine, research, and high technology. Its population is diverse, with more than 64 identified nationalities represented; 38 percent of the county population is Black/African American, 11 percent is Hispanic (any race), and 4 percent is Asian. The 2005 U.S. Census estimated that the population in Durham County was about 242,582 with 8.1 percent under 5 years old and 24.3 percent under 18 years old (U.S. Census Bureau, 2007). The population in poverty in Durham County in 2000 was 28,557 (13.4 percent) and the child poverty rate was 17.2 percent (N.C. Rural Economic Development Center, 2007).

The RAP initiative began in School Year (SY) 2003–2004. RTI is providing an independent evaluation of the implementation and outcomes of the project; the final data collection for the purposes of this evaluation was completed in May 2006. The purpose of the initiative is to apply research and best practices about learning and literacy with lessons learned about children with learning disabilities to create a new model to help increase children's chances of reading success.

## **2. READING ACHIEVEMENT PROGRAM IN DURHAM PUBLIC SCHOOLS**

### **2.1 Description of The Hill Center Reading Achievement Program**

The Hill Center Reading Achievement Program (RAP) is a Hill Center Methodology adaptation specifically created as a public school program in which struggling readers are pulled out of their regular classrooms daily for short periods of time to receive specialized instruction. RAP addresses the five essential components of a successful reading program, as put forth in the National Reading Panel Report of 2000: phonological awareness, phonics, fluency, vocabulary, and comprehension (NICHD, 2002). The curriculum has been modified so that it can be implemented in a class period ranging from 45 minutes to 1 hour.

RAP takes The Hill Center reading curriculum and segments it into five levels ranging from pre-reading skills to decoding and spelling multisyllabic words. Phonological awareness, phonics, fluency, vocabulary, and comprehension, as well as spelling, are the core of the daily instructional RAP session. While students work in small groups of four, each student has an individualized curriculum to provide instruction in areas where there are demonstrated skill deficits in reading and spelling. Students are assessed and assigned a level of instruction and use workbooks and readers that target specific phonetic patterns taught at each level. Small units of information are presented sequentially and practiced daily until a set criterion is met for 3 to 5 consecutive days and overlearning is achieved. Mastered skills are reviewed weekly to ensure retention.

RAP classes meet a minimum of four times per week and are designed to maximize opportunities for oral and written student responses and success experiences. Each RAP class has a maximum of four students. All student responses are graphed and charted daily by the teachers and students to document mastery before students advance to a higher skill level. Student-teacher interaction focuses on praise and positive reinforcement of correct answers or approximations of the correct response. Students participate in RAP for a minimum of 1 year.

Each level of RAP includes carefully selected material used for instruction. Students use workbooks that target the specific phonetic patterns taught at each level, along with linguistically controlled readers (Merrill Linguistic Readers) and appropriate multisensory strategies to supplement instruction in reading and comprehension.

## 2.2 Methodology and Data Collection

### 2.2.1 Elementary School Selection

Following discussions among Hill Center staff, Durham Public School administrators, elementary school principals, and Exceptional Children (EC) teachers,<sup>1</sup> nine elementary schools were selected for participation in the RAP initiative. Schools were selected on the basis of their interest in, support for, and commitment to the training and implementation of the RAP. Selecting schools in this manner was critical given the proposed duration of the project and the extent of time required by administrators and teachers to participate in workshops, meetings, and discussions of classroom observations.

Five of the eight selected schools included grades kindergarten (K) through 5 and the remaining three included grades pre-K through 5.<sup>2</sup> The number of students enrolled in the selected schools ranged from 200 to 747 students, with an average of 577.<sup>3</sup> The average percentage of African American students enrolled in the schools was 49 percent (range: 11 to 88 percent), the average percentage of Hispanic students enrolled was 14 percent (range: 2 to 28 percent), and the average percentage of white students enrolled was 34 percent (range: 1 to 83 percent). The average percent of students eligible for free or reduced-price lunch was 48 percent (range: 12 to 90 percent).

### 2.2.2 Durham Public School Teacher Training

Over the 3-year study period (2003 to 2006), 23 EC teachers from nine public schools in Durham, North Carolina, were trained to implement RAP. Fifteen teachers were trained prior to the 2003–2004 school year and an additional eight teachers were trained prior to the 2004–2005 school year (see Table 2-1).

**Table 2-1. Teachers Participating in RAP in Durham Public Schools by School Year**

School Year	Number of Teachers Newly Trained on RAP	Number of Returning Teachers	Total
2003–2004	15	0	15
2004–2005	8	11	19 <sup>a</sup>
2005–2006	0	12	12

<sup>a</sup>Three of the 19 teachers did not finish the year teaching RAP and did not return to the study in 2005–2006.

<sup>1</sup> The term “exceptional child” typically refers to children with special problems related to physical disabilities, sensory impairments, emotional disturbances, learning disabilities, and mental retardation.

<sup>2</sup> One of the nine selected schools did not have teachers actively using RAP during the study period. As a result, this school is not included in this overview.

<sup>3</sup> Data reported here is from the Common Core of Data, Public School Data, 2004–2005 School Year, <http://nces.ed.gov/ccd/>, accessed April 10, 2007.

Of the 12 teachers participating in the program in SY 2005–2006, four returned for their second year of teaching RAP and the remaining eight returned for their third year of teaching RAP. Teachers who did not continue from one year to the next either left the school system or were assigned to other teaching responsibilities within their school that precluded them from implementing RAP and, therefore, their further participation in the study.<sup>4</sup>

Training for all teachers participating in the study involved the same sets of activities. First, teachers participated in a 4-day training roughly 1 month prior to the beginning of the school year in August 2005. The training included a 3-day Hill Center Methodology workshop and a 1-day RAP workshop. The Hill Center Methodology training focuses on The Hill Center reading, written language, and math methodology—a precision teaching method utilizing charting and graphing of student progress—as well as The Hill Center’s Reading Assessment instrument, which is used to determine the appropriate entry level of instruction for each student. The RAP training focuses on the fundamentals of phonological awareness and phonics as a bridge to improving reading fluency and comprehension.

The training included 45 hours of coursework and a minimum of five classroom observations with direct feedback. With successful completion of these requirements, teachers received Level I Professional Education Program (PREP) certification in RAP. Materials provided to teachers included the RAP manual with The Hill Center student assessment for phonological awareness and word attack, the reading and spelling methodology, and the word lists for each of the five levels of the program. DVDs depicting students and teachers in instructional situations were also used in conjunction with training. During the first year of implementation, the grant provided all the classroom materials for the students as well. Subsequently, the Durham Public School system was responsible for ordering student materials.

Although teachers received their basic training on RAP in the initial 4-day training, the majority of their follow-up training occurred throughout the evaluation. Within 18 months of the initial RAP training, Hill Center Master Mentors conducted five site visits to all nine schools.<sup>5</sup> Site visits included classroom observations of the EC teachers implementing RAP at that school. As part of the observations, The Hill Center trainers gave teachers a numerical score on how well they implemented the program (1 to 4). The Hill Center mentor discussed the observation and the implementation rating with each teacher immediately following the observation.

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<sup>4</sup> In SY 2004–2005, one of the teachers initially trained in 2003 transferred to a school that had no prior involvement in the study. However, the principal of this school agreed to allow the teacher to continue using RAP with her students and the school was added to the study. The teacher and school remained in the study for the final year of data collection (SY 2005–2006).

<sup>5</sup> Hill Center Master Mentors are experienced Hill Center teachers who serve as trainers for both the Hill Center Methodology and various outreach programs, such as RAP.

In addition to the site visits, The Hill Center conducted three 3-hour follow-up meetings with all participating teachers, roughly 3, 6, and 8 months after the initial RAP training. These follow-up meetings took place throughout the life of the grant; the content for each meeting varied. One meeting involved a review of the RAP PREP requirements (leading to certification in The Hill Center's RAP at the Teaching Level), the use of a variety of phonics-related materials, and the RAP manual and forms.<sup>6</sup> The Hill Center staff and participating teachers also shared their successes and challenges in using RAP and discussed insights gleaned from the classroom observations conducted. Another meeting involved a review of reading comprehension, a demonstration and review of how to develop questions and how to model responses (the drill component of RAP), as well as an opportunity for teachers to discuss their successes and challenges in using RAP. These meetings also gave teachers a chance to share and learn from one another.

Approximately 1 year after their initial training on RAP, all participating EC teachers were asked to attend a 2-day RAP Part 2 training. The 2-day RAP workshop included a review of RAP methodology, additional work on phonological awareness and phonics, observation of Hill Center classrooms during reading and written language classes, and work with numerous case studies to discuss strategies for managing a variety of classroom scenarios.

### ***2.2.3 Classroom Observations of EC Teachers***

EC teachers were rated by Hill Center Master Mentors on their proficiency in implementing RAP during each of the five classroom observations conducted within an 18-month period following their initial training. The Hill Center observer rated each teacher on the following categories and then assigned an overall proficiency level to the teacher after the classroom observations were complete:

- Drill activities
- Phonological awareness
- Word attack
- Fluency: timed reading from a list
- Fluency: timed reading from a text
- Oral/silent reading
- Comprehension

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<sup>6</sup> All Durham Public School EC teachers who participated in all of the training activities provided by the Hill Center and who satisfactorily completed all certification requirements for the PREP Teaching Level Certification in RAP (45 hours of course work, worth 4.0 continuing education units [CEUs] in reading, five classroom observations with written and oral feedback, and other requirements that enhance the implementation of RAP), were eligible for certification. Of the 23 teachers who participated in the initial training RAP, 9 were certified at the Teaching Level and three were certified at the Mentor level. The Hill Center's professional education programs are accredited by the International Multisensory Structured Language Education Council and adhere to the rigorous standards and requirements set forth by that organization.



- Oral/written spelling
- Classroom management

### **2.2.4 Student Selection**

Durham Public School EC teachers who participated in the program were asked to identify children with learning disabilities who might benefit from the program. Following this selection step, there were still openings for students; teachers were then invited to identify any child having trouble with reading who might benefit from participation. In all, 151 students participated in RAP across the 3-year study period.<sup>7</sup>

### **2.2.5 Student Achievement Data Collected from Teachers and the Durham Public School System**

This section includes a description of the student achievement data collected from the nine participating elementary schools. Data collection efforts were coordinated with the school district, teachers, and The Hill Center to collect parental consent forms, student information sheets, attendance records (to measure the number of instructional hours), and pre- and post-test scores on four tests of the Woodcock Johnson-III (WJ-III) Tests of Achievement (nationally normed reading achievement tests): Passage Comprehension, Reading Fluency, Letter-Word Identification, and Word Attack. In addition, pre- and post-test scores on the North Carolina EOG tests were collected with assistance from Durham Public Schools.

WJ-III assessment scores were collected for all students participating in the study (grades 1–5). Students were assessed on the WJ-III prior to their involvement in RAP. After approximately 7 months of participation in RAP, students were assessed a second time. Students who participated in RAP a second year were assessed again approximately 12 months after their first post-test assessment. Similarly,

#### **Woodcock Johnson III Subtests**

**Passage Comprehension:** measures reading comprehension, requires the subject to orally supply the missing word removed from each written sentence or very brief paragraph (e.g., “Woof,” said the \_\_\_\_\_, biting the hand that fed it.).

**Reading Fluency:** measures ability to quickly read sentences and decide if they are true or false.

**Letter-Word Identification:** measures the ability to identify letters and pronounce words correctly.

**Word Attack:** measures skill in applying phonic and structural analysis skills to the pronunciation of unfamiliar printed words; reading nonsense words (e.g., plurp, fronkett) aloud to test phonetic word attack skills.

<sup>7</sup> An additional four students (all fifth-grade students) were assigned to a teacher trained on RAP. However, this teacher did not implement RAP with the extent of fidelity required to meet program standards. As a result, students assigned to this teacher could not be counted as having participated in RAP for that study year.

students who participated in RAP a third year were assessed a final time approximately 24 months after their second post-test assessment.<sup>8</sup>

At the elementary school level, the North Carolina EOG tests are administered only to students in grades 3–5. Consequently, pre- and post-test comparisons of scores on the EOG tests are limited to students who were in grades 3–5 at the time they were in the study. The North Carolina EOG tests focus on reading and mathematics and are curriculum-based, multiple-choice achievement tests specifically aligned to the North Carolina *Standard Course of Study*. The tests include a variety of strategies to measure the academic performance of North Carolina students (NCDPI Division of Accountability Services, 2004).

The North Carolina EOG Test-Reading Comprehension assesses reading and knowledge of vocabulary by having students read both literary and informational selections and then answer questions related to those selections. The North Carolina EOG Test-Mathematics measure competency goals and objectives that are organized into four strands: (1) number sense, numeration, and numerical operations; (2) spatial sense, measurement, and geometry; (3) patterns, relationships, and functions; and (4) data, probability, and statistics.

Students take the tests during the final weeks of the school year. Three types of scores are reported in each subject area for the tests: developmental scale scores, percentiles, and achievement levels. For each subject area, a range of developmental scores is defined for each achievement level at each grade level, making it possible to determine the achievement level of each student based on his or her grade level and developmental scores on the EOG tests. This study reports findings on changes in students' developmental scores as well as movement of students across achievement levels.

**North Carolina End-of-Grade Tests  
Achievement Levels<sup>a</sup>**

**Level I:** Students do not have sufficient mastery of knowledge and skills in the subject area to be successful at the next grade level.

**Level II:** Students show inconsistent mastery of knowledge and skills in the subject area and are minimally prepared to be successful at the next grade level.

**Level III:** Students consistently demonstrate mastery of the grade level subject matter and skills and are well prepared for the next grade level.

**Level IV:** Students consistently perform in a superior manner clearly beyond that required to be proficient at grade level work.

<sup>a</sup>NCDPI Division of Accountability Services, 2004.

With the assistance of the Durham Public Schools, EOG test scores in reading comprehension and mathematics were collected for all students participating in the study. Pre-RAP EOG scores for third graders participating in the study were the scores from

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<sup>8</sup> While the schedule of assessments for most students followed this pattern, there is some variation in the length of time between the pre- and post-test assessments because children joined the program at different times during the school year. Generally initial post-test assessments were administered to students after at least 6 months of their involvement in RAP classrooms.

students' pre-EOG tests when they entered third grade; pre-RAP EOG scores for fourth and fifth grade students were the scores from students' EOG tests taken at the end of the prior school year.



### 3. TEACHER AND STUDENT CHARACTERISTICS

#### 3.1 Teacher Demographics and Implementation Ratings

The following sections provide demographic information for teachers as well as results regarding their proficiency in using The Hill Center Reading Achievement Program (RAP) with their students.

##### 3.1.1 Teacher Demographic Data

Twenty-two of the 23 teachers were female. Over half (14 of 23) of the EC teachers had completed a master's degree; all participating Exceptional Children (EC) teachers had completed at least a bachelor's degree.<sup>9</sup> At the time of their participation in the study, 20 of the 22 EC teachers indicated that they were currently certified by North Carolina to teach EC.<sup>10</sup>

Teachers also reported their area(s) of certification. Eighteen of 21 EC teachers noted more than one area of certification. The most common areas of certification included the following: Learning Disabled (10 of 21), Educable Mental Disabilities (6 of 21), Specific Learning Disabled (5 of 21), Behavioral-Emotional Disabilities (4 of 21), and Cross Categorical Resource (4 of 21).<sup>11</sup>

In addition to information regarding their education and certification, teachers were asked to report on their experience as a teacher (see Table 3-1). The median total years of overall teaching experience was 15 years;<sup>12</sup> the median total years of teaching at their current school was 2.5 years.

**Table 3-1. Teacher Experience, Overall and Current School**

Total Years	Teaching Experience Overall <sup>a</sup>	Teaching Experience at Current School <sup>b</sup>
Less than 5 years	4	13
5 to 9 years	4	7
10 to 14 years	3	2
15 to 19 years	4	0
More than 20 years	7	0

<sup>a</sup>Missing data for one teacher; n=22.

<sup>b</sup>Missing data for one teacher; n=22.

<sup>9</sup> Missing data for one teacher.

<sup>10</sup> Missing data for one teacher.

<sup>11</sup> Missing data for two teachers.

<sup>12</sup> For both teacher experience overall and teaching experience at current school, the median was used instead of the mean due to outliers; because the range was so large, the mean was not informative.

### 3.1.2 Results from Classroom Observations of Teachers

The Hill Center conducted five classroom observations of each EC teacher as part of their training. After each classroom observation, the observer from The Hill Center gave teachers feedback on their teaching using RAP, including suggestions for improvement. For each observation, The Hill Center rated teachers on their overall proficiency level of implementing RAP as well as their proficiency implementing specific components of RAP. The possible overall proficiency ratings are as follows: very proficient, proficient, somewhat proficient, and not proficient. In order to become a RAP-certified teacher, teachers must achieve a rating of very proficient or proficient on four of the five observations.

**Overall, 68 percent of EC teachers were rated at either the “very proficient” or the “proficient” level of implementing RAP in their first 18 months of participation in the study.**

On their final classroom observation (approximately 18 months after their initial training), 7 of 22 EC teachers earned a score of “very proficient” on their overall implementation of RAP and another eight earned a score of “proficient.” Two of the three teachers who earned a score of “not proficient” did not continue participating in the study beyond the first year. By the third year of the study, 10 of the 12 participating EC teachers (83 percent) were those who had earned a rating of “very proficient” or proficient.”<sup>13</sup>

## 3.2 Student Data

### 3.2.1 Student Demographic Data

RTI collected student demographic data to describe the students in the study and to examine how the effects of RAP vary across student participants. In all, 151 students were enrolled in the RAP program at some point during the 3-year period of data collection; 137 of these students have at least one set of pre- and post-test scores.<sup>14</sup> All of the children participating in the study were between the first- and fifth-grade levels (see Table 3-2). Approximately 85 percent of students were in the second, third, or fourth grade at the time they entered the study; just over half of these students were third graders.

As indicated by the data presented in Table 3-2, the sample was diverse in terms of gender, disability, and other factors. Over half (55 percent) of the students included in the study were African American, 30 percent were white, and about 15 percent were Hispanic. A greater percentage of males than females participated in the study (66 percent and 34 percent, respectively). Sixty-one percent of students were eligible for free or reduced-price lunch, and about 14 percent spoke English as a second language.

<sup>13</sup> One teacher dropped out of the study prior to the first scheduled observation.

<sup>14</sup> Most analyses presented in this report are based on the 137 cases with at least one pair of pre- and post-test scores available. However, growth curve modeling analyses involve algorithms that make it possible to include cases where only one data point, rather than a pair, is available. As a result, the reported N for these analyses may be greater than 137.

**Table 3-2. Demographic Data for Participating Children**

	Durham RAP Students	
	Number	Percentage <sup>a</sup>
<b>Grade level at entry to RAP</b>		
First grade	9	6.6
Second grade	31	22.6
Third grade	60	43.8
Fourth grade	25	18.3
Fifth grade	12	8.8
Total	137	100.0
<b>Race</b>		
African-American	75	54.7
White	41	29.9
Hispanic	21	15.3
Total	137	100.0
<b>Gender</b>		
Male	90	65.7
Female	47	34.3
Total	137	100.0
<b>Eligible for free or reduced-price lunch</b>		
Yes	84	61.3
No	53	38.7
Total	137	100.0
<b>English as a second language</b>		
Yes	19	13.9
No	118	86.1
Total	137	100.0
<b>Identified to receive Exceptional Children's services</b>		
Yes	108	78.8
No	29	21.1
Total	137	100.0
<b>Type of learning difference<sup>b</sup></b>		
Learning disability (LD)	68	63.0
Attention Deficit Hyperactivity Disorder (ADHD)	11	10.2
LD and ADHD	1	0.9
Other	28	25.9
Total	108 <sup>c</sup>	100.0

(continued)

**Table 3-2. Demographic Data for Participating Children (continued)**

	Durham RAP Students	
	Number	Percentage <sup>a</sup>
<b>IQ</b>		
Below average (below 85)	59	52.2
Average (85–115)	54	47.8
Total	113 <sup>d</sup>	100.0
<b>Repeated a grade</b>		
Yes	86	62.8
No	51	37.2
Total	137	100.0

<sup>a</sup>Totals may not be equal to 100 due to rounding.

<sup>b</sup>Type of learning difference for which student was eligible to receive EC services.

<sup>c</sup>Because only 108 students (79 percent) were identified to receive EC services, only those students are included here.

<sup>d</sup>Typically, only students identified to receive EC services take IQ tests; this was not the case for all children participating in this study. In addition, IQ score data is missing for four students identified to receive EC services. Seventy-nine students took the Wechsler Intelligence Scale for Children-3rd Edition (WISC-III), 15 took the Developmental Activities Screening Inventory (DASI), 11 took the Wechsler Intelligence Scale for Children-4th Edition (WISC-IV), and another 6 took the Universal Nonverbal Intelligence Test (UNIT). One child took three additional assessments: Cognitive Assessment System (CAS), Wechsler Preschool and Primary Scale of Intelligence (WPPSI), and the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R).

In addition to being a diverse sample, the children participating in RAP were clearly at risk of not being successful in school. Just over 60 percent of students were eligible for free or reduced-price lunch and 79 percent were identified as eligible to receive EC services, with 63 percent of these children having a learning disability (LD) and approximately 10 percent having Attention Deficit Hyperactivity Disorder. Fifty-two percent of all participating children had a below-average IQ and 63 percent had repeated a grade.

### **3.2.2 Student Participation Data**

Teachers who participated in RAP identified students who would be appropriate candidates for the program. The reasons students were selected for enrollment in RAP are presented in Table 3-3. For 88 students (64 percent), only one reason for selection was indicated; for the remaining 49 students, more than one reason for selection was indicated. The most common reason, indicated for 42 percent of students, is that the student was at risk of failing his or her North Carolina End-of-Grade (EOG) tests. Being a student with an LD at risk of failing a grade or failing the EOG tests were also somewhat common reasons for selection (indicated for 23 and 22 percent of enrolled students, respectively). In addition, having an IQ lower than 85 was also a relatively common reason for enrollment (indicated for 23 percent of participating students).



**Table 3-3. Reasons Students Entered RAP**

	Durham RAP Students	
	Number	Percentage
At risk for failing end-of-grade (EOG) tests	57	41.6
IQ less than 85	32	23.4
LD identified, at risk of failing grade	32	23.4
LD identified, at risk of failing EOG tests	30	21.9
Failed EOG tests	23	16.8
LD identified, passed EOG tests	10	7.3
LD identified, failed EOG tests	9	6.8
Exiting Reading Recovery	8	5.8
Other (repeated grade, at-risk in reading)	11	8.3

Nearly half (45 percent) of the students participating in RAP remained enrolled in the program through the end of the study period. Of those who exited earlier than anticipated, about one-third of students (31 percent) exited the program because they moved. Approximately 23 percent of students enrolled in RAP left the program because they graduated to middle school. About 25 percent of students enrolled in RAP had to exit the program because the teacher left the school, too few students were enrolled, parents withdrew their child from the program, or a classroom teacher refused to allow his or her student to participate (see Table 3-4).

Approximately 45 percent of the students participating in RAP during the study period were enrolled in RAP for 1 school year only, another 42 percent were enrolled in RAP for 2 school years, and 18 students (13 percent) enrolled for 3 years (see Table 3-5).

Program developers recommend that students receive 108 hours per year of instruction in the program. The intent was for students to be pre-tested before starting the program (Time 1); have their first post-test at the end of the first school year (Time 2); if they continued in the program for a second year, have their second post-test at the end of the second school year (Time 3); and if they continued in the program for a third year, have their third year post-test at the end of the third school year (Time 4). However, students entered and exited the program throughout the school year, and sometimes students took their pre-test in one school year and their post-test in the next. Thus, it was impossible to determine the specific number of hours of instruction students received per year and have that number align with their pre- and post-test scores. To determine the extent of student exposure to RAP, the total number of instructional hours of reading remediation that children participating in the study received was calculated using the number of minutes per session, number of days a week of sessions, school holidays, and the number of times a

**Table 3-4. Reasons Students Exited RAP**

	Durham RAP Students	
	Number <sup>a</sup>	Percentage
Moved	23	30.6
Went to middle school	17	22.7
Teacher left the school/not enough students enrolled	7	9.3
Classroom teacher refused to allow student to participate	4	5.3
Parents withdrew student from program	4	5.3
Tested out or graduated from RAP	3	4.0
Not an appropriate candidate for RAP	1	0.1
Missing explanation	16	21.3
Total	75	100.0

<sup>a</sup>A total of 62 students (45.2 percent) remained enrolled in RAP through the end of the study period. The total number of students who exited RAP at any point during the study period is 75 (54.7 percent).

**Table 3-5. Number of School Years Enrolled in the RAP Study**

	Durham RAP Students	
	Number	Percentage
1 school year only	61	44.5
2 school years	58	42.3
3 school years	18	13.1
Total across study	137	100.0

student was absent. Attendance data were collected for all participating students each year to calculate the number of instructional hours each student received.

Students received an average of 56.01 hours of instruction between their Time 1 (pre-test) and Time 2 (first post-test) assessments (N = 137), occurring over an average of 8.78 months, and an average of 59.56 instructional hours between their Time 2 (first post-test) and Time 3 (second post-test) assessments (N = 71), occurring over an average of 11.55 months (see Appendix A, Table A-1).<sup>15</sup>

<sup>15</sup> With only 18 students continuing from a second to third school year (i.e., from Time 3 to Time 4), an estimate for a distinct Time 3 to Time 4 segment is not possible due to variability or instability of the data.

## 4. READING ACHIEVEMENT ASSESSMENT RESULTS

The main research questions for the evaluation of The Hill Center Reading Achievement Program (RAP) in Durham Public Schools are as follows:

1. What effect did The Hill Center RAP have on student achievement in reading based on nationally norm-based tests (i.e., the WJ-III subtests) and the North Carolina End-of-Grade tests?
2. How many instructional hours do students receive as part of The Hill Center Reading Achievement Program?
3. What is the average growth per year in the achievement test scores of RAP students?
4. How do the effects of The Hill Center RAP vary across student participants?
5. How does the degree of teacher implementation of the program affect the achievement test scores of RAP students?

The following sections provide the results of the evaluation, focusing first on the WJ-III assessment results and then on the North Carolina EOG test results.

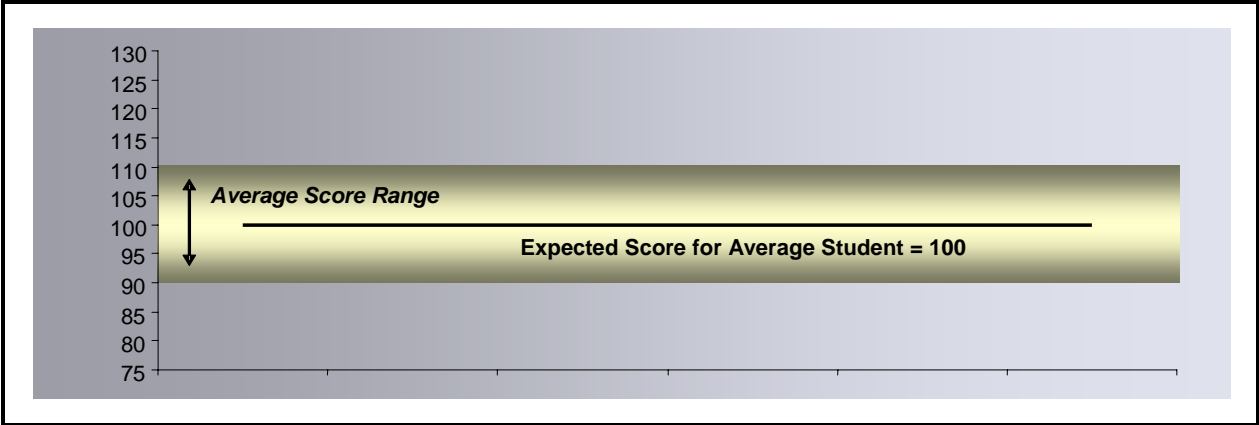
### 4.1 Woodcock Johnson-III Assessment Results

#### 4.1.1 *Changes in Student Achievement as Measured by Woodcock Johnson-III Subtests*

The WJ-III subtests were used to assess all participating students' achievement in reading prior to and after instruction with RAP, including students in grades 1–5. The WJ-III achievement scores used in this study are standard scores, which means that the scores have been transformed from raw scores for convenience and ease of interpretation. Using standard scores allows measurement of the amount of growth in a student's achievement during the period he or she was enrolled in the program. A student who makes the academic growth expected for an average child of his or her age would have the same standard score from one year to the next. The expected amount of change in an average child's score, therefore, is zero; a change greater than zero indicates that a child is learning at a faster rate than expected for an average child that age. A change less than zero indicates the reverse—that the child is actually learning at a slower rate than his or her average-ability peers. If the average change in scores for a group of students is greater than zero, this change indicates collective improvement for the group. The average standard score for the WJ-III tests is 100, with scores between 90 and 110 considered to be in the average range (see Figure 4-1) (Mather and Woodcock, 2001).

Mean scores for students on all four of the WJ-III subtests are reported in Table 4-1. On average, prior to their participation the RAP program, students achieved at levels lower than expected for average students on all four WJ-III subtests; the mean scores at Time 1

Figure 4-1. Explanation of WJ-III Standard Score



(baseline, or prior to participation in RAP) fall below the lower limit of the average score range. However, growth curve modeling shows that between Time 1 and Time 2 (i.e., after one academic year of participation in RAP) students participating in the program increased their reading scores and made gains at rates faster than those expected for average children their age (see Appendix A, Table A-2, for detailed statistics associated with these tests).<sup>16</sup> These students, on average, reversed their pattern of falling behind in reading to progressing at a rate faster than that expected of the average student, thus narrowing the gap with average students.

Table 4-1 shows that students significantly improved their scores on three of the WJ-III tests: Passage Comprehension, Reading Fluency, and Word Attack. Increases in performance ranged from 2.29 standard score points on the Reading Fluency subtest to 4.67 standard score points on the Word Attack subtest. Students moved very close to the average score range (90–110) for the WJ-III after participating in the program for 1 school year. Table 4-1 also presents the rates of growth in achievement (standard score points per instructional hour) on the WJ-III subtests corresponding to students’ first year of participation in RAP. The growth per instructional hour rates were statistically significant for three WJ-III subtests (Passage Comprehension, Letter-Word Identification, and Word Attack). In other words, Durham RAP students’ growth in achievement on these tests was higher than that expected of their average-ability peers. On the Letter-Word Identification subtest, RAP students improved their score at the same rate as that expected of the average student. Improving at this rate is an accomplishment, considering that at-risk students typically progress at a rate slower than that of average students.

<sup>16</sup> Growth-curve modeling analyses are reported for two time segments: Time 1 to Time 2 and Time 2 to Time 3. Due to the limited number of students who participated in RAP for a third year, growth-curve modeling is not reported for the Time 3 to Time 4 segment (i.e., an estimate for a distinct Time 3 to Time 4 segment is not possible due to variability or instability of the data).

**Table 4-1. Change in WJ-III Standard Test Scores from Time 1 to Time 2**

	Time 1 Mean	Time 2 Mean	Change in Standard Score	Number of Students	Growth per Instructional Hour
<b>W-JIII test data</b>					
Passage Comprehension	80.34	83.54	3.20***	149	<b>0.06***</b>
Reading Fluency <sup>1</sup>	80.61	82.89	2.29***	124	<b>0.04***</b>
Letter-Word Identification	81.25	81.39	0.14	149	<b>0.00</b>
Word Attack	81.36	86.04	4.67***	147	<b>0.08***</b>

Note: Results presented here do not include IQ score in the model because including IQ reduces the N by 17 percent.

<sup>1</sup>The number of students given the Reading Fluency test was likely lower than the other WJ-III tests because a higher level of reading ability is required to take this test compared with other tests.

\*\*\*  $p < .001$ .

Table 4-2 shows findings on levels of achievement on the WJ-III subtests for students who participated in RAP for 2 years. As indicated previously, the expected change in standard scores on the WJ-III for an average student from one year to the next is zero. Thus, growth-curve modeling of WJ-III subtest scores for students participating in RAP for 2 years shows that their growth in achievement on three of the four WJ-III subtests (Passage Comprehension, Letter-Word Identification, and Word Attack) was about the same as average students of similar ages. In addition, based on their level of achievement on the Reading Fluency subtest at Time 2 compared with Time 1, the findings show that Durham RAP students performed significantly better on the Reading Fluency subtest, learning at a faster rate than expected for average children their age. The mean in Reading Fluency increased 2.07 standard score points ( $p < .05$ ), from 82.89 to 84.97; the rate of growth was .04 standard score points per instructional hour.

#### **4.1.2 Impact of Instructional Hours on Achievement**

In this section, findings are presented on the number of instructional hours students received as part of RAP and the impact of instructional hours on achievement, including the average growth per year in the achievement test scores of RAP students. Previously we noted that the total number of instructional hours of reading remediation received by children participating in the study was calculated using the number of minutes per session, number of days a week of sessions, school holidays, and the number of times a student was absent. Students received an average of 56.01 hours of instruction between their Time 1 (pre-test) and Time 2 (first post-test) assessments and an average of 59.56 instructional hours between their Time 2 (first post-test) and Time 3 (second post-test) assessments.<sup>17</sup>

<sup>17</sup> As indicated previously, with only 18 students continuing from a second to third school year (i.e., from Time 3 to Time 4), an estimate for a distinct Time 3 to Time 4 segment is not possible due to variability or instability of the data.

**Table 4-2. Change in WJ-III Standard Test Scores from Time 2 to Time 3**

	Time 2 Mean	Time 3 Mean	Change in Standard Score	Number of Students	Growth per Instructional Hour
<b>WJ-III test data</b>					
Passage Comprehension	83.54	83.23	-0.30	134	-.01
Reading Fluency	82.89	84.97	2.07*	124	.04*
Letter-Word Identification	81.39	81.84	.45	134	.01
Word Attack	86.04	87.24	1.21	134	.02

Note: Results presented here do not include IQ score in the model because including IQ reduces the N by 17 percent.

\* $p < .05$ .

Data derived through analysis of changes in WJ-III standard test scores can be used to estimate the increase in test scores that students would have achieved if they had received the recommended number of instructional hours for 1 and 2 years of participation in RAP (assuming that growth per instructional hour would have been the same for the additional hours). According to The Hill Center, the minimum number of expected instructional hours is 108 hours per year and the maximum number of expected instructional hours is 180 hours; the average number of expected instructional hours is 144 hours per year (i.e., 4 hours per week); over 2 years, the average expected number of instructional hours would double to 288 hours per 2 years.

Table 4-3 shows a comparison of expected standard score increases for students with 1 and 2 years of participation in the program using two different estimates for instructional hours received: (1) the average number of instructional hours Durham RAP students actually received in 1 and 2 years of participation in the program (56 and 116 hours, respectively); and (2) the average number of instructional hours recommended for students to receive in 1 and 2 years of participation in RAP (144 and 288 hours, respectively). Findings indicate that expected increases in standard scores are statistically significant for three of the four WJ-III subtests using either actual or recommended numbers of instructional hours.

However, the findings in Table 4-3 also show that had students received the average number of hours of instruction recommended or expected for 1 and 2 years of participation, their gains on three of the four WJ-III subtests (Passage Comprehension, Letter-Word Identification, and Word Attack) would have doubled (at least). Figure 4-2 presents these findings graphically.

**Table 4-3. Standard Score Increase of Average Versus Expected Number of Instructional Hours<sup>1</sup>**

	Average Score at Pretest	Expected Increase in Score of Child with 1 Year of Participation		Expected Increase in Score of Child with 2 Years of Participation		Increase in Standard Score per Instructional Hour	
		Average = 56 hours	Expected = 144 hours	Average = 116 hours	Expected = 288 hours	Pre to Post 1	Post 1 to Post 2
Passage Comprehension	80.34	3.43***	8.22***	3.05**	7.49**	.06***	.01
Reading Fluency	80.61	2.45***	5.88***	5.02***	10.88***	.04***	.03*
Letter-Word Identification	81.25	.15	.37	.71	1.45	.00	.01
Word Attack	81.36	5.00***	12.01***	6.50***	14.93***	.08***	.02

<sup>1</sup> Scores from growth curve model.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Figure 4-2. Comparison of Increase in Achievement Based on Actual Versus Expected Instructional Hours of RAP**

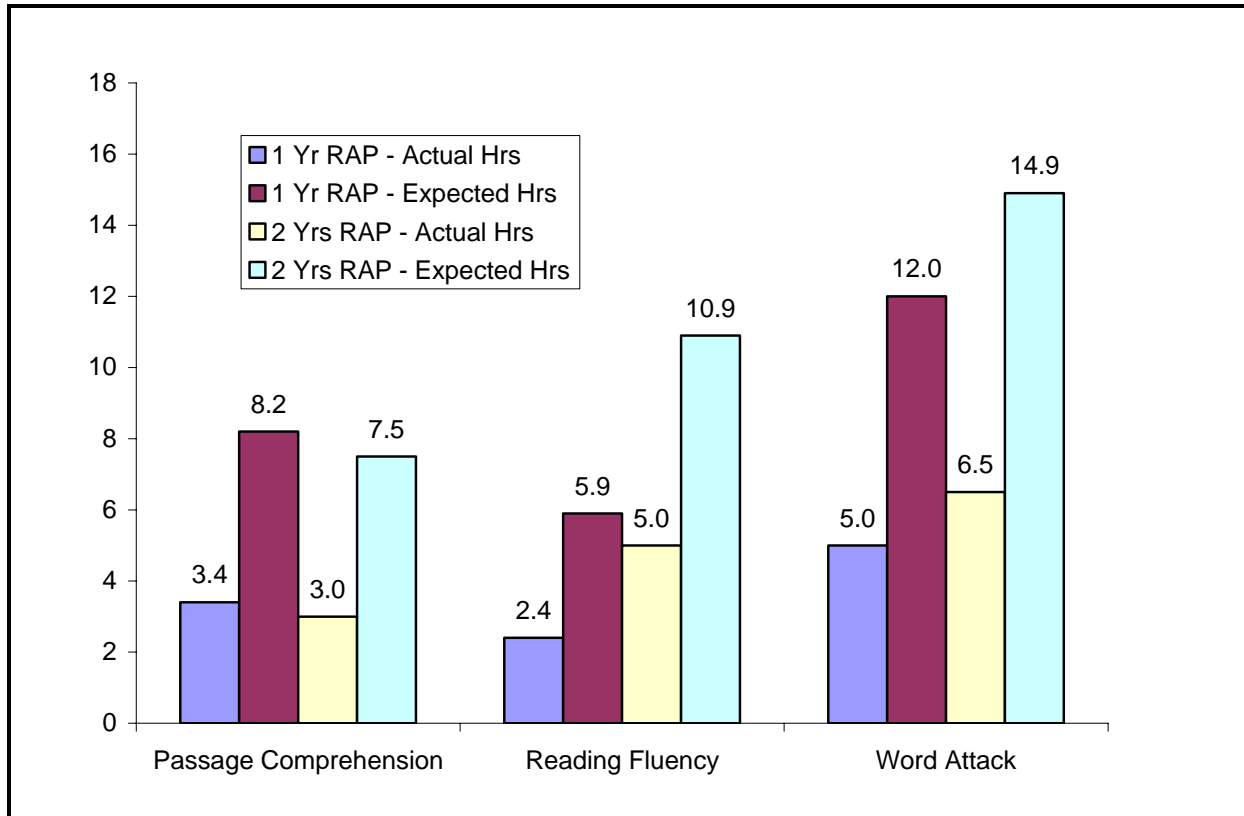


Table 4.3 also shows that the increase in standard score per instructional hour for students with 1 year of participation in RAP was statistically significant for three of the four WJ-III subtests. However, there is only one subtest—Reading Fluency—for which a statistically significant increase in standard score per instructional hour for students with 2 years of participation was found (.03 standard score points,  $p < .05$ ). These findings taken together suggest that students' first year of participation in RAP has a greater impact on their growth in reading achievement (as measured by three of the four WJ-III subtests) than their second year of participation.

#### 4.1.3 Group Differences in Changes in Student Achievement

One of the critical research questions addressed by this evaluation focuses on how the effects of The Hill Center Reading Achievement Program vary across student participants based on several key student characteristics (e.g., race/ethnicity, free or reduced-lunch eligibility status, identification as an EC student, diagnoses of a learning disability, IQ level, English as a second language status). The findings show that some group differences occurred in student baseline scores at Time 1.<sup>18</sup> Table 4-4 provides the difference in baseline standard scores for each subgroup of students compared with its corresponding reference group (e.g., minority compared with nonminority) for each of the WJ-III subtests. Statistically significant differences are highlighted in bold.

**Table 4-4. Group Differences in Baseline WJ-III Scores**

Student Group	Difference in Baseline Scores (Standard Score Points) <sup>1</sup>			
	Passage Comprehension	Reading Fluency	Letter-Word Identification	Word Attack
Minority vs. nonminority	<b>-1.47*</b>	0.04	-0.94	<b>-2.64***</b>
ESL vs. non-ESL	-2.40	<b>-4.65*</b>	-3.22	2.18
Eligible vs. not eligible for free or reduced-price lunch	-0.85	-1.37	1.49	0.37
Male vs. female	-0.32	-0.42	0.13	0.13
EC identified vs. non-EC identified	<b>-1.88***</b>	<b>-1.95***</b>	<b>-2.34***</b>	<b>-1.92***</b>
Grade repeater vs. non-grade repeater	<b>-2.37***</b>	<b>-2.09**</b>	<b>-3.47***</b>	<b>-2.99***</b>

<sup>1</sup>Negative values indicate that the performance of the student group (e.g., minority students) was lower than the performance of the reference group (e.g., nonminority students) by the reported number of standard score points.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>18</sup> The group difference results reported here are from a model that includes the IQ score because it is significantly correlated with free or reduced-price lunch status and whether the student had repeated a grade.



Prior to all students' participation in RAP, minority students (African-American and Latino students) scored lower than non-minority students (white students) on Passage Comprehension and Word Attack subtests. Students speaking English as a second language (ESL) scored lower than native English speaking students on Reading Fluency. Students identified as EC and students who had repeated a grade scored lower than other students at baseline on all four of the WJ-III subtests.

Though significant differences were found between student groups on their achievement scores at baseline, few group differences occurred in the rates at which students' standard scores on the tests changed between Time 1 and Time 2. Furthermore, only two of these differences were indicative of a slower growth rate: African-American and Latino students showed less of an increase in Reading Fluency (–.03 less of an increase per instructional hour,  $p < .001$ ) and Letter-Word Identification (–.02 less of an increase per instructional hour,  $p < .01$ ) compared with white students.<sup>19</sup> The remaining differences represented growth rates for student groups that were faster than their peers, including peers who scored significantly higher on their achievement tests at baseline. For example, students who had repeated a grade showed more of an increase in Reading Fluency (.03 more of an increase per instructional hour,  $p < .001$ ), Letter-Word Identification (.03 more of an increase per instructional hour,  $p < .001$ ), and Word Attack (.03 more of an increase per instructional hour,  $p < .01$ ) than those students who did not repeat a grade. ESL students showed a greater increase in Reading Fluency than non-ESL students (.06 more of an increase per instructional hour,  $p < .05$ ).

Between Time 2 and Time 3, there were no group differences in the rate at which students' standard scores on the tests changed. The finding of few significant group differences in the rate at which students' standard scores on tests changed between Time 1 and Time 2 and no significant group differences between Time 2 and Time 3 suggests that the impact of RAP on students' achievement is comparable across student groups. This is a particularly important finding for an intervention that is aimed at public school student populations, given the diversity of those populations within and across public school systems. Furthermore, these findings suggest that participation in RAP may be related to at-risk students achieving reading growths rates similar to their peers.

#### ***4.1.4 Impact of Degree of Teacher Implementation on Student Achievement***

One of the research questions addressed by the evaluation of RAP in Durham Public Schools involved examining the relationship between the degree of teacher implementation of the program and the achievement test scores of RAP students. To address this question, an implementation score for each teacher was calculated by averaging the implementation scores received by the teacher after each observation in the 18-month period following

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<sup>19</sup> The unit of measure is standard score points (e.g., .03 standard score points).

training on RAP. Each student was assigned their teacher's implementation score for the year (i.e., first, second, or third year of the study). Analysis of the data found that teachers' implementation score did not have a statistically significant impact on students' achievement. One possible explanation for this finding is that the majority of teachers were rated as proficient or very proficient in implementing RAP; in the first year of the study, 68 percent of teachers were rated as proficient or very proficient and by the third year of the study 10 of the 12 teachers (83 percent) were those who had been rated as proficient or very proficient.

The next section presents findings on another measure, the North Carolina EOG tests, used to assess the impact of RAP on student achievement. In addition to offering data on student achievement in reading, the EOG scores provide data on student achievement in mathematics, making it possible to examine whether improvement in reading is accompanied by improvement in mathematics. As noted previously, at the elementary school level the EOG tests are administered only to students in grades 3-5. Thus, the total number of students for whom EOG scores were available for analysis is fewer than the total number of students for whom WJ-III results were available.

## **4.2 North Carolina End-of-Grade Assessment Results**

### ***4.2.1 Changes in Student Achievement as Measured by North Carolina End-of-Grade Assessments***

Tables 4-5 and 4-6 present the changes in students' EOG scores after participating in RAP from Time 1 (baseline) to Time 2 (after 1 year of RAP) and from Time 2 to Time 3 (after 2 years of RAP), respectively.<sup>20</sup> The tables show developmental scale scores. The raw score for the test is converted into the developmental scale score to allow for the comparison of students' EOG scores by subject from one year to the next. Thus, unlike the standard scores reported for the WJ-III subtests, an EOG score that remains unchanged from one year to the next indicates that a child has made no improvement during that year. The developmental scale scores are divided into four levels: levels I and II correspond to below-grade-level achievement, and levels III and IV correspond to at- or above-grade-level achievement, respectively.

The changes in the EOG test scores of third, fourth, and fifth grade students from before to after 1 academic year of involvement in RAP show significant growth in achievement.

The improvement in EOG test scores can also be seen in changes in the number of students performing at or above grade level. For third graders, two students scored at or above grade level in reading before participating in the RAP program; after participating in RAP, 16 students scored at or above grade level, including three students in EOG Level IV (no third-

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<sup>20</sup> See Appendix B for the means, standard deviations, and ranges for North Carolina EOG scores at all time points (i.e., Time 1 through Time 4) for each grade level.

**Table 4-5. Change in End-of-Grade Test Scores, Time 1 to Time 2**

EOG Test Data <sup>a</sup>	Time 1 Scale Score	Time 2 Scale Score	Change in Scale Score (Range)	Is Change Statistically Significant?	Number of Students	Number of Students Performing at or above Grade Level (EOG Level III or IV)	
						Time 1	Time 2
<b>Third Graders</b>							
Reading EOG test	226.3	236.4	9.44 (-4 to 19)	Yes (t = 11.4***)	48	2 (Level III = 2, Level IV = 0)	16 (Level III = 13, Level IV = 3)
Math EOG test	230.0	246.6	16.20 (4 to 32)	Yes (t = 18.2***)	45	0 (Level III = 0, Level IV = 0)	27 (Level III = 23, Level IV = 4)
<b>Fourth Graders</b>							
Reading EOG test	233.2	240.8	6.50 (-10 to 24)	Yes (t = 3.88***)	22	1 (Level III = 1, Level IV = 0)	7 (Level III = 4, Level IV = 3)
Math EOG test	248.4	252.3	3.59 (-5 to 16)	Yes (t = 3.4**)	22	15 (Level III = 14, Level IV = 1)	20 (Level III = 16, Level IV = 4)
<b>Fifth Graders</b>							
Reading EOG test	240.1	249.9	8.75 (3 to 15)	Yes (t = 4.89**)	8	2 (Level III = 2, Level IV = 0)	7 (Level III = 7, Level IV = 0)
Math EOG test	251.9	250.9	.25 (-4 to 8)	No (t = 18,ns)	8	5 (Level III = 4, Level IV = 1)	6 (Level III = 6, Level IV = 0)

\*\*\*  $p \leq .001$ , \*\*  $p \leq .01$

<sup>a</sup>The scores presented here are developmental scale scores. The raw scores are converted into developmental scale scores to allow for the comparison of students' EOG scores by subject from one grade to the next (NCDPI Division of Accountability Services, 2004).

grade students scored in EOG Level IV before the RAP program). For fourth graders, seven students performed at or above grade level after 1 year of participation in RAP (compared with one student prior to participation in RAP). At the fifth-grade level, seven students performed at grade level (an increase from two students prior to participation in RAP after 1 year of participation in RAP); no fifth-graders performed above grade level prior to or after 1 year of participation in RAP. Figure 4-3 shows the numbers of students performing at Level III (i.e., grade level) and Level IV (i.e., above grade level) for each grade level prior to and after 1 year of participation in RAP.

**Figure 4-3. Numbers of Students Performing at Level III and Level IV, Time 1 to Time 2**

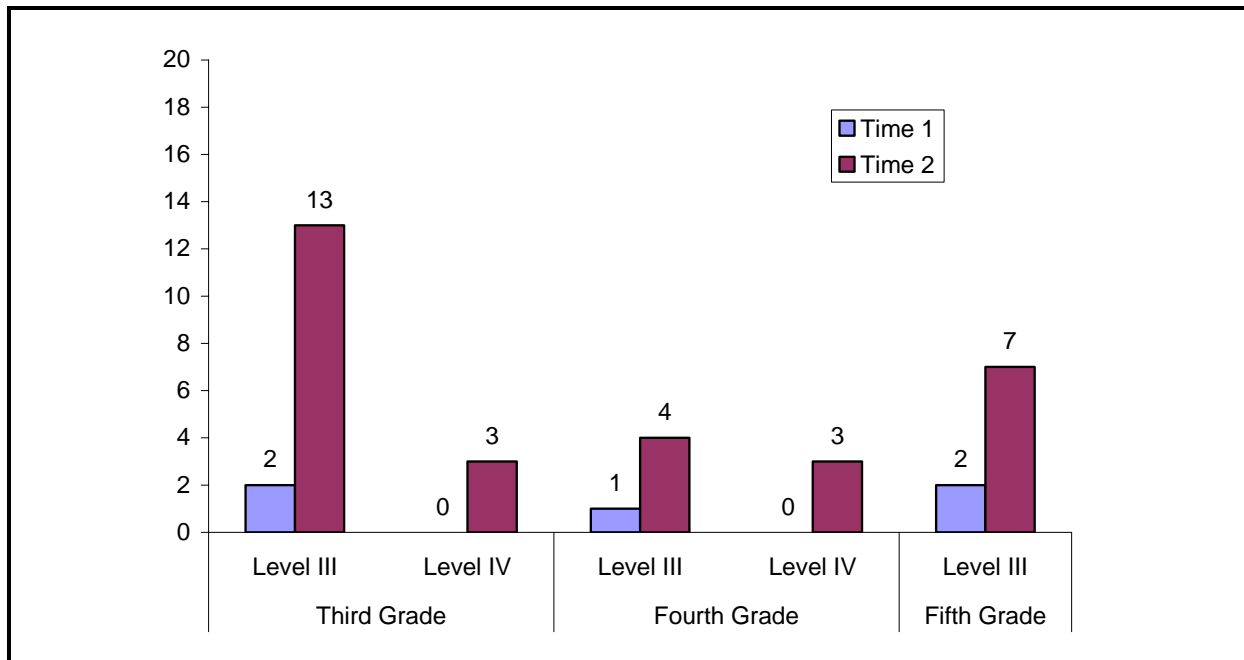


Table 4-6 presents the changes in third-, fourth-, and fifth-grade students' EOG test scores after 2 years of participation in RAP (i.e., from Time 2 to Time 3).<sup>21</sup> The EOG reading achievement scores of third- and fourth-grade students significantly increased from Time 2 to Time 3. Reading scores for students in third grade increased by an average of 6.00 points and those for students in fourth grade increased by an average of 6.38 points; no fifth-grade EOG scores were available for analysis. Though math scores increased significantly between Time 1 and Time 2 for third- and fourth-grade students, paralleling their improvement in reading achievement, only third-grade students significantly increased their math EOG achievement scores from Time 2 to Time 3 (increasing by 6.59 points).

Table 4-6 also presents the number of students performing at or above grade level at the end of their first and second years of participation in RAP. Despite the relatively limited number of students with EOG scores available at Time 3, the findings show patterns in students' performance across the two achievement levels (i.e., at or above grade level) that are generally consistent from Time 2 to Time 3.

<sup>21</sup> One constraint on the findings reported in this table is the limited number of students per grade level (third-, fourth-, and fifth-grade levels) who participated in RAP for 2 years and for whom a pair of EOG scores (at Time 2 and Time 3) was available for analysis.

**Table 4-6. Change in End-of-Grade Test Scores, Time 2 to Time 3**

EOG Test Data <sup>a</sup>	Time 2 Scale Score	Time 3 Scale Score	Change in Scale Score (Range)	Is Change Statistically Significant?	Number of Students (for t test)	Number of Students Performing at or above Grade Level (EOG Level III or IV)	
						Time 2	Time 3
<b>Third Graders</b>							
Reading EOG test	236.4	243.2	6.00 (-11 to 19)	Yes (t = 3.86***)	22	16 (Level III = 13, Level IV = 3)	10 (Level III = 10, Level IV = 0)
Math EOG test	246.6	253.3	6.59 (-2 to 11)	Yes (t = 7.92***)	17	27 (Level III = 23, Level IV = 4)	0 (Level III = 0, Level IV = 0)
<b>Fourth Graders</b>							
Reading EOG test	240.8	246.4	6.38 (-2 to 18)	Yes (t = 3.72**)	13	7 (Level III = 4, Level IV = 3)	7 (Level III = 6, Level IV = 1)
Math EOG test	252.2	250.5	.50 (-13 to 8)	No (t = .17)	6	20 (Level III = 16, Level IV = 4)	5 (Level III = 2, Level IV = 3)
<b>Fifth Graders</b>							
Reading EOG test	240.1	NA <sup>a</sup>	NA	NA	NA	7 (Level III = 7, Level IV = 0)	NA
Math EOG test	251.9	NA	NA	NA	NA	6 (Level III = 6, Level IV = 0)	NA

Note: Only cases with test data at Time 2 and Time 3 are included in the analyses reported here.

Sample sizes differ between Time 2 and Time 3 because fewer students participated in RAP at Time 3.

<sup>a</sup>No test scores available.

### 4.3 Summary

Taken together, the findings on RAP students' changes in achievement on the WJ-III subtests and the North Carolina EOG tests strongly support the premise that participation in RAP is related to an increase in the reading achievement of students who are at risk for failure in reading. Both the WJ-III subtests and the North Carolina EOG tests show statistically significant improvement in student reading achievement during the course of 1 academic year (or less) of participation in RAP and during the course of an additional academic year of participation. Findings on three of the four WJ-III achievement subtests at the end of 1 year of participation in the program show that Durham RAP students' achievement grew at faster rates than their average-ability peers. Increases also were found in the number of third-, fourth- and fifth-grade students performing at or above grade level in reading following 1 year of participation in RAP. Though not a goal of RAP, significant increases also were found in third- and fourth-grade students' achievement in mathematics.

Changes in students' reading achievement on the WJ-III subtests and the North Carolina EOG tests after an additional year of participation in RAP also support the assertion that participation in RAP benefits students at risk for failure in reading. Comparing test scores from year 1 to those from year 2 shows that students performed significantly better on the Reading Fluency WJ-III subtest, outpacing the growth in achievement of average children their age. Durham RAP students' growth in achievement on the remaining three subtests was about the same as their average ability peers, a positive finding given the at-risk status of the Durham RAP student population. The North Carolina Reading EOG tests also show statistically significant improvement in third- and fourth-grade students' reading achievement from year 1 to year 2 of their participation in RAP.

Analysis of the impact of instructional hours on achievement show that despite the fact that Durham RAP students received fewer instructional hours than recommended, they performed significantly better on the WJ-III achievement tests after 1 year of participation in RAP. The findings also show that had students received the recommended number of instructional hours, their gains would have doubled (or more).<sup>22</sup> Nevertheless, the findings show statistically significant gains per instructional hour on three of the four WJ-III subtests.

Minority students, ESL students, EC-identified students, and students repeating a grade scored statistically significantly lower at baseline on various WJ-III subtests relative to their peers. However, analysis of rates of growth in achievement after 1 year of participation in RAP show that ESL students and students repeating a grade had higher gains per instructional hour than their peers. In other words, these students learned at rates faster than their peers. Between year 1 and year 2 of participation in RAP, there were no significant group differences in the rates at which students' standard scores on the WJ-III achievement tests changed. This finding indicates that students who had at one time learned at slower rates than their peers were learning at comparable rates.

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<sup>22</sup> This assertion assumes that growth would be constant or linear across the additional hours.

## 5. CONCLUSION

The purpose of the evaluation was to examine the effectiveness of the instructional methodologies of The Hill Center Reading Achievement Program (RAP) by specifically addressing the following five questions:

- What effect did The Hill Center RAP have on student achievement in reading, based on nationally norm-based tests and North Carolina End-of-Grade tests?
- How do the effects of The Hill Center RAP vary across student participants?
- How many instructional hours do students receive as part of The Hill Center RAP?
- What is the average growth per year in the achievement test scores of RAP students?
- How does the degree of teacher implementation of the program affect the achievement test scores of RAP students?

Results show that students in the RAP program made statistically significant improvements on three of the four Woodcock Johnson III (WJ-III) tests. In these three tests (Reading Fluency, Passage Comprehension, and Word Attack), RAP students actually progressed at a rate greater than that expected of the average student. On all three of these tests, RAP students moved closer to the average score range (90 to 110) after participating in the program.

**Students reversed their pattern of falling behind in reading to progressing at a rate faster than expected of the average student, thus narrowing the gap with average students.**

On the Letter-Word Identification test, RAP students improved their score at the same rate as that expected of the average student (because their change score was not significantly different from zero). Even improving at this rate is an accomplishment, considering that at-risk students, particularly those with learning disabilities, typically progress at a slower rate than average students.

Many of the students involved in this study were not only at risk for school failure due to a learning disability, but also due to other factors such as low socioeconomic status, low IQ, and previous school failure (i.e., having repeated a grade). While participating in RAP, these students progressed at a rate faster than expected or at the rate expected of an average student for their age. However, these students were not average students: they also faced significant, often multiple, barriers to success. Thus, progressing at a rate faster than expected of an average student is a successful result for them; even progressing at the rate expected of an average student is a successful result. The findings show that during their time in the RAP program, these students did not fall further behind in achievement compared with their peers; they either maintained their achievement level or actually began catching up to their peers. As the children typically selected for this program progress at

slower than expected rates, these findings provide support for the hypothesis that RAP helped participating students.

Findings from students' performance on the North Carolina EOG tests reinforce the findings for the WJ-III subtests, i.e., that participation in RAP is related to improvement in student achievement in reading. In their first year of participation in RAP, third-, fourth-, and fifth-grade students' Reading EOG scores showed significant growth in achievement. In addition, third- and fourth-grade students Math EOG scores significantly improved with 1 year of participation in RAP. In addition, the numbers of students performing at or above grade level also increased from baseline to the end of the first year of participation in RAP. For those students continuing to participate in RAP for 2 years, statistically significant increases in scale scores on the Reading EOG test were found for third- and fourth-grade students. The lack of availability of data precluded an analysis of the impact of a second year of participation for fifth graders (i.e., those students who would have entered RAP in grade 4 and continued their participation in grade 5).

Another important finding from the evaluation of RAP in Durham Public Schools is that despite the fact that students in the program, on average, received less than half of the recommended average number of instructional hours on RAP (56 hours versus 144 hours), they achieved significantly higher scores and higher rates of growth in achievement after 1 year and, in some instances, 2 years of participation in the program. Yet, based on estimates derived using recommended numbers of instructional hours, students could have improved at least twice as much if they had received the recommended number of instructional hours. Some of the reasons they did not were preventable. For example, some teachers started later in the year than expected because they had not yet received the materials that they ordered. Other reasons were unavoidable, such as new students starting the program in the spring because other students in RAP had moved out of the school system.

Analysis of the data found that teachers' implementation score did not have a statistically significant impact on students' achievement. A previous section of this report noted that one possible explanation for this finding: the majority of teachers were rated as proficient or very proficient in implementing RAP across the study period. While this finding points to the effectiveness of The Hill Center's RAP training approach, it poses challenges for analyzing the relationship between the degree of implementation of the program and achievement test scores of RAP students. Investigation of this relationship in future research may necessitate the development of instruments designed to further differentiate levels of implementation or the inclusion of control groups to ensure greater variation in levels of implementation.

Two limitations to this study are the lack of a control group and a way to control for the influence of possibly confounding variables such as other programs that students may have



received or parental influence. Thus, caution must be used in attributing the increase in students' scores to participation in RAP rather than or in addition to other factor(s). However, these students did improve at a rate faster than expected for typical students as measured by a nationally normed test, which shows the progress they made compared with average students. Future research should evaluate this program with a randomized control group.



## 6. REFERENCES

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## APPENDIX A: TABLES

**Table A-1. Mean Instructional Hours and Months of Participation in RAP**

<b>Label</b>	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Instructional hours - Time 1 to Time 2	137	56.01	19.49	9.37	107.00
Instructional hours – Time 2 to Time 3	71	59.56	21.27	22.47	111.00
Months – Time 1 to Time 2	133	8.78	2.94	3.65	17.23
Months – Time 2 to Time 3	59	11.55	3.11	14.26	30.28

**Table A-2. Piecewise Growth Model Time 1 (Baseline) to Time 2 Comparisons**

<b>W-J III Test</b>	<b>Estimate</b>	<b>Standard Error</b>	<b>t-Value</b>	<b>P-Value</b>	<b>d<sup>1</sup></b>
<b>Passage Comprehension</b>					
Baseline mean	80.34	0.90			
Time 1 mean	83.54	0.92			
Time 2 mean	83.23	1.08			
Change in score, Baseline to Time 1	3.20	0.64	5.01	<.0001	0.66
Change in score, Time 1 to Time 2	-0.30	0.85	-0.36	0.7227	-0.05
Change in score, Baseline to Time 2	2.90	0.86	3.36	0.0009	0.46
<b>Reading Fluency</b>					
Baseline mean	80.61	0.93			
Time 1 mean	82.89	0.91			
Time 2 mean	84.97	1.12			
Change in score, Baseline to Time 1	2.29	0.59	3.88	0.0001	0.58
Change in score, Time 1 to Time 2	2.07	0.86	2.39	0.0178	0.37
Change in score, Baseline to Time 2	4.36	0.90	4.82	<.0001	0.70
<b>Letter Word</b>					
Baseline mean	81.25	1.02			
Time 1 mean	81.39	1.03			
Time 2 mean	81.84	1.14			
Change in score, Baseline to Time 1	0.14	0.56	0.26	0.7971	0.04
Change in score, Time 1 to Time 2	0.45	0.75	0.60	0.5524	0.08
Change in score, Baseline to Time 2	0.59	0.76	0.78	0.4387	0.11
<b>Word Attack</b>					
Baseline mean	81.36	0.89			
Time 1 mean	86.03	0.93			
Time 2 mean	87.24	1.14			
Change in score, Baseline to Time 1	4.67	0.78	5.95	<.0001	0.77
Change in score, Time 1 to Time 2	1.21	0.99	1.22	0.2249	0.17
Change in score, Baseline to Time 2	5.88	1.04	5.66	<.0001	0.74

<sup>1</sup>d: Cohen's d effect size measure.

**Table A-3. Passage Comprehension—Change Over Time by Instructional Hours**

Label	Mean Change	Standard Error	t-value	P-Value	d
Time 1 to Time 2 per Instructional hour	0.06	0.01	5.01	<.0001	0.66
Time 2 to Time 3 per Instructional hour	-0.01	0.01	-0.36	0.7227	-0.05
Change Baseline to Time1, 56 hours	3.43	0.68	5.01	<.0001	0.66
Change Baseline to Time 1, 144 hours	8.22	1.64	5.01	<.0001	0.66
Change Baseline to Time 2, 116 hours	3.05	1.03	2.95	0.0035	0.40
Change Baseline to Time 2, 288 hours	7.49	2.12	3.53	0.0005	0.48

**Table A-4. Reading Fluency—Change Over Time by Instructional Hours**

Label	Mean Change	Standard Error	t-value	P-Value	d
Time 1 to Time 2 per Instructional hour	0.04	0.01	3.88	0.0001	0.58
Time 2 to Time 3 per Instructional hour	0.03	0.01	2.39	0.0178	0.37
Change Baseline to Time1, 56 hours	2.45	0.6308	3.88	0.0001	0.58
Change Baseline to Time 1, 144 hours	5.88	1.5139	3.88	0.0001	0.58
Change Baseline to Time 2, 116 hours	5.02	1.0875	4.62	<.0001	0.68
Change Baseline to Time 2, 288 hours	10.88	2.2219	4.90	<.0001	0.713

**Table A-5. Letter-Word Identification—Change Over Time by Instructional Hours**

Label	Mean Change	Standard Error	t-value	P-Value	d
Time 1 to Time 2 per Instructional hour	0.00	0.01	0.26	0.7971	0.36
Time 2 to Time 3 per Instructional hour	0.01	0.01	0.60	0.5524	0.08
Change Baseline to Time1, 56 hours	0.15	0.60	0.26	0.7971	0.04
Change Baseline to Time 1, 144 hours	0.37	1.44	0.26	0.7971	0.04
Change Baseline to Time 2, 116 hours	0.71	0.91	0.78	0.4381	0.11
Change Baseline to Time 2, 288 hours	1.45	1.88	0.77	0.4403	0.11

**Table A-6. Word Attack—Change Over Time by Instructional Hours**

Label	Mean Change	Standard Error	t-value	P-Value	d
Time 1 to Time 2 per Instructional hour	0.08	0.01	5.95	<.0001	0.77
Time 2 to Time 3 per Instructional hour	0.02	0.02	1.22	0.2249	0.17
Change Baseline to Time1, 56 hours	5.00	0.84	5.95	<.0001	0.77
Change Baseline to Time 1, 144 hours	12.01	2.02	5.95	<.0001	0.77
Change Baseline to Time 2, 116 hours	6.50	1.24	5.26	<.0001	0.69
Change Baseline to Time 2, 288 hours	14.93	2.56	5.82	<.0001	0.76



## APPENDIX B: TABLES

**Table B-1. Grade 3 North Carolina End-of-Grade Scores for Reading and Math**

Label	Number	Mean	Standard Deviation	Minimum	Maximum
Reading Scale Score Time 1	56	226.34	5.57	219.00	243.00
Reading Scale Score Time 2	52	236.42	7.17	222.00	259.00
Reading Scale Score Time 3	22	243.18	7.51	229.00	254.00
Reading Scale Score Time 4	9	247.67	6.96	239.00	262.00
Math Scale Score Time 1	48	229.98	6.10	219.00	242.00
Math Scale Score Time 2	49	246.63	6.08	234.00	257.00
Math Scale Score Time 3	17	253.29	5.34	242.00	261.00
Math Scale Score Time 4	0	NA	NA	NA	NA

**Table B-2. Grade 4 North Carolina End-of-Grade Scores for Reading and Math**

Label	Number	Mean	Standard Deviation	Minimum	Maximum
Reading Scale Score Time 1	23	233.22	7.42	219.00	248.00
Reading Scale Score Time 2	24	240.83	8.39	230.00	258.00
Reading Scale Score Time 3	13	246.38	6.98	237.00	259.00
Reading Scale Score Time 4	0	NA	NA	NA	NA
Math Scale Score Time 1	23	248.43	6.25	239.00	263.00
Math Scale Score Time 2	24	252.25	5.88	242.00	265.00
Math Scale Score Time 3	6	250.50	7.71	237.00	257.00
Math Scale Score Time 4	0	NA	NA	NA	NA

**Table B-3. Grade 5 North Carolina End-of-Grade Scores for Reading and Math**

<b>Label</b>	<b>Number</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Reading Scale Score Time 1	9	240.11	6.49	232.00	251.00
Reading Scale Score Time 2	8	249.88	5.79	236.00	254.00
Reading Scale Score Time 3	0	NA	NA	NA	NA
Reading Scale Score Time 4	0	NA	NA	NA	NA
Math Scale Score Time 1	9	251.89	6.90	243.00	261.00
Math Scale Score Time 2	8	250.86	5.08	242.00	256.00
Math Scale Score Time 3	0	NA	NA	NA	NA
Math Scale Score Time 4	0	NA	NA	NA	NA