The Effects of a Computer-Assisted and Culturally Relevant Repeated Reading Intervention on the Oral Reading Fluency of First Grade Students At-Risk

Thesis

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By

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Abstract

This study examined the effects of a novel computer software program titled “Reading Relevant and Culturally Engaging Stories (R.A.C.E.S)” on the oral reading fluency and comprehension of urban first-grade students who had been identified as at risk for reading failure. A multiple baseline across participants design was used to determine if the repeated reading strategy using culturally relevant materials delivered through the computer software would increase participant oral reading fluency and comprehension. Oral reading fluency was measured by correct words per minute and comprehension was measured by responses to maze passages on both treatment and generalization probes.

Four first-grade students participated in the study. Each received instruction at his or her skill level as identified during baseline. In addition to repeated measures of oral reading fluency, pre-and post-test measures were administered to all students. These consisted of Woodcock Reading Mastery Test – Revised subtests of word attack and word identification and Dibels Next Oral Reading Fluency Benchmark assessment and phoneme segmentation. During baseline, treatment, and maintenance conditions, data were collected on the following dependent variables: correct words per minute of orally read culturally relevant passages; correct responses to questions on the corresponding CR mazes; correct words per minute of orally read AIMSweb generalization probes; correct responses to questions in the corresponding AIMSweb generalization mazes;
maintenance of comprehension and fluency 1 week after intervention has was completed; correct words per minute on cold reads of CR passages; and participants independence in correctly interacting with the computer software.

Treatment probes were given after each story sequence was successfully completed and generalization probes were given after approximately three treatment probes except when participants consistently took 2–3 sessions to finish a story, in which case they were given a generalization probe every five-six stories. There were a total of 27 culturally relevant 1st grade stories and 7 culturally relevant 2nd grade stories/treatment probes and 17 generalization passages were available (8–9 generalization passages were used for participants). Results indicated that after 9–13 weeks the packaged intervention was effective for increasing the oral reading fluency and comprehension of practiced culturally relevant passages for all participants.

The intervention was also effective for increasing the oral reading fluency and comprehension on all 4 of the participants on novel AIMSweb passages. These findings add to the research base supporting the use of repeated readings for first-grade students via computer-assisted instruction to supplement instruction. Further, the findings suggest that skill acquisition and generalization might be promoted by the use of culturally relevant materials. Limitations, directions for future research, and implications for practice are offered.

Keywords: oral reading fluency, repeated reading, computer-assisted instruction, culturally relevant, urban learners
Dedication

To our future professionals…

Success: To laugh often and much, to win the respect of intelligent people and the affection of children, to earn the appreciation of honest critics and endure the betrayal of false friends, to appreciate beauty, to find the best in others, to leave the world a bit better, whether by a healthy child, a garden patch, or a redeemed social condition; to know even one life has breathed easier because you have lived. This is to have succeeded.

-Ralph Waldo Emerson
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Vita

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Chapter 1: Literature Review

Introduction

Urban schools generally have a high percentage of students from low-income families as well as a high percentage of minority students (Council of the Great City Schools, 2010). It is not uncommon for students in these schools to be reading below grade level. For example, while 35% of 4th grade students in the U.S. are reading at or above the proficient level, only 20% of students in urban schools are reading at a proficient level, and 42% are reading below a basic reading level (National Center for Education Statistics, 2011). Because reading is a skill that is used in everyday life, this achievement gap could have a negative impact on students’ post-school futures (Cartledge & Musti-Rao, 2007). This achievement gap could be due to the fact that many low-income students enter kindergarten without the knowledge of fundamental literacy skills (Hart & Risley, 1995). No Child Left Behind (NCLB, 2001) was created with a focus on improving reading and math skills with an emphasis on children from low-income families. According to the National Center for Education Statistics, schools are considered high poverty if 75% or more of students attending the school receive free or reduced lunch. In these schools students who identify as minority students (Black or Hispanic) disproportionately are likely to come from low-income families.
**Reading Achievement**

One goal of NCLB was to close the achievement gap between students who come from low-income and higher-income families and for students to be proficient in reading and math by 2014 (NCLB, 2001). Despite the efforts of NCLB and overall higher reading scores for students in Grades 4–8 in 2013 compared to scores in 1992, these changes in scores are not significant (NCES, 2013).

The National Center for Children In Poverty also reports that 31% of children who are White live in low-income homes and 65% of children who are Black live in low-income homes. To illustrate the score difference between both groups, in 1992 White students’ average reading scores were 224, and Black students’ average scores were 192 (a difference of 32 points). By 2013 White students progressed to 232 and Black students progressed to 206 (a difference of 26 points). The scores listed demonstrate that an achievement gap still exists.

Although the averages of 4th grade reading scores were higher in 2013 than in 2011 for nine states, results vary from state to state. For example, the reading scores for Ohio 4th grade students in 2013 were 37% higher then the national average. Students who are eligible for free/reduced lunch have shown slight increases in their scores. From 2003 to 2013, scores for students who were eligible for free lunch improved from 199 to 206, and scores for students eligible for reduced lunch increased from 211 to 220 (National Center for Education Statistics, 2013).
Further, the achievement gap between Black and White students in Ohio has widened. In 2011 White students scored 229 and Black students scored 204 (a difference of 26 points); in 2013 White students scores increased to 231 and Black students scores decreased to 195, widening the gap to 36 points.

Average results of 4th grade reading proficiency tests also vary district to district: Urban schools have an even wider achievement gap than non-urban areas (Olszewski-Kubilius, 2006). For example, the Columbus City School district has not shown major gains when it comes to achievement scores. The Ohio Department of Education (ODE, 2013-2014) reported that Columbus City schools received a “D” for reaching achievement scores on state tests. The performance index includes six levels and each district receives a point for every student in each level. The higher the academic level the more points the district receives. Columbus City school district received 79.8 points out of 120. For closing the gap the district received an “F,” their goal for reading is set at 84.9%. Black students scored 60.2% and multiracial students received 73.4%. In Ohio, reading progress was assessed for students in Grades K–3. Out of the entire district 40.6% of students reached proficiency on the 3rd grade Ohio Achievement Assessment (OAA).

These data show that reading continues to be an instructional area that needs improvement. They also suggest that intervention should take place in early grades (i.e., before 3rd grade) to prevent future reading failure (Gersten et al., 2009). If poor and/or minority students are not performing to standard, they show risk for reading failure.
Schools who serve these students should focus on reading interventions that incorporate evidence based practices for teaching reading skills (McCracken, 2013)

**Reading Skills Needed**

It is important for children to learn how to read so that they are equipped to experience academic success and advance in the future (Dougherty, 2014). Teachers have an important role when providing reading instruction. Effective reading instruction should include instruction in phonemic awareness, phonics instruction, fluency skills, vocabulary, and comprehension (The National Reading Panel; NRP, 2000). Using explicit and systematic instruction to teach these reading skills are very effective when teaching under performing students basic reading skills (Bursuk & Damer, 2010).

Due to the lack of pre-literacy skills when entering the classroom, many urban students start school academically behind their suburban peers (Cartledge & Musti-Rao, 2007). This indicates that early and intensive instruction should take place with elementary students in younger grades, to avoid widening the gap between White and Non-white peers. Specifically, the NRP (2000), states that early literacy instruction should include teaching phonics (i.e., decoding), fluency, comprehension, and vocabulary development to better literacy skills.

**Decoding**

Decoding is the ability to apply knowledge of letter-sound relationships, and is a skill that students need in order to be successful in reading (readingrockets, 2014). Students with reading deficiencies struggle more with reading words that are on their
grade level, which makes comprehension difficult (Hudson et al., 2011). Beginning readers who do not have decoding skills are not up to par and typically fall behind in reading (Hines, 2009). Decoding accuracy is an important pre literacy skill to have in order to become skilled in reading words (Hudson et al., 2011).

In order to improve decoding skills for students, Cartledge et al. (2011) examined the long-term effect of an early reading intervention program (ERI), which focused on phonemic awareness and the alphabetic principle. The study included students who received intervention for one year, students who received intervention for two years, and a control group. To measure how the students generalized their skills, the skills were continuously monitored one and two years after intervention ended. The comparison group received instruction only from the classroom teachers, and were also monitored. ERI is a scripted program that includes 126 lessons on phonemes, phonological awareness, and alphabetic principle. Each lesson was 30 minutes long and was taught using a model-lead-test pattern. The instructor first modeled the skill that was being taught, guided practice was then implemented, and after the guided practice the student worked on the skill being taught independently. An additional fluency activity was added the second year of the intervention. The instructor taught new words to students from a story with connected text, and provided an example of reading fluently. The students repeatedly read the passages to gain fluency. Pre-and post-assessments included Letter Word Identification and Word Attack sub-tests from the Woodcock Johnson III (Woodcock, McGrew, and Mather 2001): and the Dynamic Indicators of Basic Early

Results showed positive effects of the ERI program on literacy skills. Students who show risk for reading failure were able to achieve and maintain benchmark status. Students who received early intervention in the first year benefitted the most and were no longer considered at risk. Three effects were observed for students who were not initially showing risk (i.e., control group). One group showed declining performance over the course of 2 years (control group), another group remained at benchmark (ER-1; students who received one year of treatment), and the third group of students remained at high risk, needing more intensive interventions (ER-2; students who received two years of treatment) (Cartledge et al., 2011).

For students with risk or disabilities who do not respond well to intervention, different approaches to instruction may need to be created (Hines, 2009). Decoding skills are an important focus for students to read fluently and comprehend. However, Cartledge et al. (2011) found that focusing on decoding skills alone was not sufficient for fluency skills to automatically emerge in young urban learners. That is for some students, fluency needs to be explicitly taught and practiced.

**Fluency**

According to the National Reading Panel (2013), fluency is being able to easily decode and blend words, read quickly, read with prosody, and comprehend what is being
read. Fluency also is also a major component in efficient literacy instruction and is reached by practicing reading until it becomes natural. When reading instruction focuses on fluency it will allow students to experience a great chance of improving reading achievement (Rasinski, 2009). Reading fluency is an important attribute of good readers; poor readers usually show a lack of reading fluency and need direct instruction in learning fluency skills (Hudson, Lane, & Pullen, 2005). To increase fluency in students, research studies have included various strategies such as, repeated readings, listening passage previews, peer coaching, coached reading, and guided readings (Berg & Lyke, 2012; Swain, Leader-Janssen, & Conley, 2013; Marr, Algozzine, Nicholson, & Dugan, 2011; Gabl, Kaiser, Long, & Roemer, 2007).

Fluency is important because of the connection between reading fluently and comprehension. A study done by Basaran (2013) showed a positive connection between reading fluency and comprehension. This study examined the relationship between 4th grade students’ reading habits, situations, conditions, and reading comprehension. Both male and female students were included. Students were in a room by themselves and they were asked to read a text and their voices were recorded. Three experts who specialized in reading fluency then listened to their voice recordings to determine how their reading fluency, including mistakes, affected their comprehension. Their comprehension was assessed through four different assessments that included fill in the blank, short answer, multiple choice, and open-ended questions. The results of this study showed that fluent reading was an indicator of comprehension. A positive relationship
was shown between reading with prosody and comprehension. Basaran stated “by helping students to acquire fluent reading skills, you also help them to develop skills regarding reading comprehension” (p. 2290).

Students with reading disabilities have difficulty with reading fluently and comprehending text. Having problems in both of these areas will cause a student to fail to comprehend because he/she is focusing on word identification. This causes the student to use cognitive skills on determining a word, decreasing his/her ability to use these skills in order to comprehend (Therrien, Gormley, & Kubina 2006).

In this study a student with a learning disability struggled with reading and comprehending grade level material. To improve his fluency and comprehension skills, a repeated reading and question generation intervention was implemented. During intervention he answered who, what, when, where, why, and how questions along with inference questions to grasp a better understanding of the text. After intervention when he was given a comprehension passage he performed better in fluency and comprehension; he started reading passages on a first grade level and advanced to the 3rd grade passages by the end of intervention. When assessed using DIBELS, this particular student was reading at a rate of 12 words per minute greater after the Re-read Adapt and Answer Comprehend intervention. Due to his increased fluency he was able to better comprehend the passage being read.

Without the ability to identify and read words fluently, a student may misinterpret what the author is trying to say in the reading and have complications comprehending.
Which is why students comprehension of a reading passage should be assessed (Hudson, Lane, & Pullen, 2005).

**Comprehension**

According to the National Center for Education Evaluation and Regional Assistance (2010), comprehension is the practice of developing meaning from written language. In order for students to comprehend a text they need to not only be able to understand what the author is stating in the text but also be able to connect background knowledge and experiences to the text. The ultimate goal of reading is for the reader to understand what is being read (Nation & Angell, 2006).

Reading comprehension and fluency go hand in hand. If a student is not able to read fluently or recognize written words this could have a negative effect on their reading comprehension (Nation and Angell 2006). Fluency is a vital part of reading that allows the reader to identify words at a quicker pace in order to comprehend the text (Martin, Elfreth, & Feng 2014). If a reader is more focused on decoding words, they usually do not have enough energy to comprehend. This could slow down the reader’s ability to read (Martin et al., 2014). Thus, fluency is the bridge to reading achievement and comprehension. Readers who do not have the primary skills of reading (decoding, phonemic awareness, phonological awareness, and blending) are limited because they are not capable of recognizing words correctly. Therefore, their ability to attend to meaning of words and working memory is being consumed which is needed in order to comprehend (Broek, Espin, Deno, Fuchs, & Jenkins 2004).
Henderson (2004) noted that students who struggled with reading not only took a long time to read but they seemed to get tired quicker, which caused them to have issues with comprehending since there was so much energy put into decoding words. Some students with specific learning disabilities are not able to read with fluency especially texts that are on grade level. They tend to read at slow speeds with minimal comprehension. This may cause them to become frustrated, receive lower grades, and give up (Henderson, 2004). Comprehension is important and students need to be fluent readers to comprehend what they are reading.

**Effective Practices to Teach Fluency**

In order for students to become fluent in reading they have to practice. There are multiple exercises to increase fluency. One of the main goals in education is to move students from the learning to read stage to the reading to learn stage (Joseph, 2008). Although instruction has been delivered in various ways some students still tend to lack the necessary reading skills to become fluent readers. Instruction taught that is not beneficial to the student’s reading deficiency can also be a barrier. In order to help students progress with reading, evidence based practices focused on fluency are being implemented. Several of those effective practices include flash card drill and practice, simultaneous verbal prompting, listening while reading, response cards, and repeated readings (Joseph, 2008).

Flash card drill and practice allows the student to read and practice the word, written on a flash card during a set time frame. Flash card drill procedures have been
found to be beneficial with helping students recognize words and increasing their comprehension skills (Tan & Nicholson 1997; Joseph 2008). Simultaneous verbal prompting is used with the flash card drill to help students with oral reading fluency skills. In this strategy the teacher says the word and definition and states the word again, and has the student repeat the word. This method has been shown to help students with reading words (Johnson, Schuster, & Bell 1996; Joseph 2008). Listening while reading is normally used when students are reading at a slower rate or have difficulty with pronouncing words in a passage. The instructor reads a passage while the student follows along and then the student reads the same passage over. This method has been shown to improve oral reading fluency, accuracy, (Daly & Martens 1994; Joseph, 2008; Skinner et al., 1993), and comprehension (Hale et al., 2005; Joseph 2008). Response cards are used to teach and monitor reading comprehension. After a story is read, the teacher asks comprehension questions and allows every student the opportunity to respond. Once everyone has responded the teacher provides corrective feedback and students are able to change their response (Joseph, 2008). When students are engaged in repeated readings this helps to improve their accuracy and to read quicker, with expression. Also, the repeated reading practice has shown to increase fluency across different grade levels, ages, and various reading levels (Carver, 1997; Freeland, Skinner, Jackson, McDaniel, & Smith, 2000; Kuhn & Stahl, 2003; Stoddard, Valcante, Sindelar, O’Shea, & Algozzine, 1993; Weinstein & Cooke, 1992; Joseph, 2008). During the repeated reading strategy the student reads a story aloud for set time frame. Stories are read aloud so the teacher can
keep track of errors and provide corrective feedback. Multiple research studies have shown repeated reading interventions to be very successful in improving reading fluency of struggling or students with risk (Ates, 2013; Strickland, Boom, & Spencer, 2013; Yurick, Robinson, Cartledge, Lo, & Evans, 2006).

**Repeated Reading Instruction**

Repeated reading instruction (RRI) is a fluency strategy “that consists of re-reading a short and meaningful passage until a satisfactory level of fluency is reached” (Strickland, Boon, & Spencer, 2013; p. 2). RRI is not a difficult strategy to implement and can be utilized in multiple settings, such as small group instruction, learning centers, and peer reading (Strickland, Boom, & Spencer, 2013). When used as a primary intervention it can be really effective (Strickland, Boom, & Spencer, 2013). RRI for struggling readers should involve direct instruction. The instructor should carefully select the reading material to match the instructional level of the student (Marlow, 2002), modeling fluent reading, giving assistance to the student while they are reading, and measuring progress (Rasinski, Homan, & Biggs, 2009).

A study focused on the usage of RRI and question generation to determine which was more effective on improving fluency and comprehension skills of students with disabilities or who were presumed showing risk for reading failure. These students were between the ages of 9-13. Students that were selected to participate in the study had either a learning disability in reading or their reading level was two or more grades below their current grade. There were a total of 19 females and 13 males, who were in grades 4th-6th.
Students were randomly assigned to one of the interventions for two weeks for five days a week. Their achievement in fluency and comprehension was measured. The dependent variables were correct words per minute, factual, and inferential questions. During the repeated reading intervention, participants were told to read the best they could and to pay attention to the reading because the researcher would follow up with questions. Next, the participant would read until they reached a certain number of correct words per minute that was already established. The story was read up to four times and corrective feedback was given. After the comprehension measures were completed the participant would move onto another passage.

The question generation intervention included six instructional components. First a cue card with general questions regarding details about the story was presented to the participant; the next step was to read the questions aloud before reading the story one time. After the participant read the story aloud, corrective feedback was given on any errors; they would then answer the question from the cue card aloud. If students answered the comprehension questions incorrectly the researcher would guide them to where the answer could be found in the story or provided the answer for them. After comprehension measures were collected the participant moved onto another passage.

The findings from this study showed that the RRI strategy benefited the participants by increasing their fluency skills by placing them at the same level as students reading at the 50th percentile. When both interventions were compared, repeated
reading was more effective at improving comprehension skills (Therrien & Hughes 2008; Freeland et al., 2000).

Strickland, Boon, and Spencer (2013) reviewed the literature to examine the effectiveness of the RRI strategy to improve reading fluency and comprehension of elementary-aged students with learning disabilities. There was a total of 19 studies completed between 2001 and 2011. There was a total of 234 participants with and without disabilities. The mean age of all students were 10.8, with ages ranging from 8-13 years old. Students participating in the study were in first-eighth grade. Five of the studies used an experimental design, seven used a multiple baseline design, five used an alternating treatment design, and one study used an AB design. The four main approaches included RRI as the primary intervention, RRI compared to other reading interventions, repeated reading combined with other reading interventions, and including RRI in a reading program. The findings from this study provide evidence that repeated reading is an effective strategy for increasing fluency and comprehension skills. Students showed moderate to large gains on practice passages, but only low to moderate on novel passages (Chard, Vaughn, & Tyler 2002; Strickland et al., 2013).

A study completed by Martin et al. (2014) examined two fluency and comprehension programs: Six-Minute Solution and Read Naturally. The purpose of using these two interventions was to determine their effect on reading fluency of students in the 3rd grade. Participants were randomly assigned to both of these programs. AIMSweb curriculum based measurement probes, were used throughout the intervention to measure
their fluency. After four weeks of intervention, results from the data collected indicated that fluency improved from using both programs, although the participants involved in the Read Naturally program showed a higher rate of correct words per minute. Martin et al., (2014) study, overall found that repeated reading programs help to increase reading fluency. These are two researched based programs to aid in increasing students reading ability. Computer assisted instruction may be a solution to help students increase their reading skills.

**Computer-assisted Instruction**

In the United States, 90% of children with learning disabilities struggle with reading independently and comprehending what they read (Vaughn, Levy, & Coleman 2002; Stetter & Hughes 2011). Students who struggle with reading may need extra assistance and/or specialized instruction (Swanson et al., 2011). There are different circumstances that cause children to fall below reading level; these circumstances can include but are not limited to minimal access to resources at home and school (Swanson et al., 2011).

In order to provide specialized instruction or extra assistance to such students who are struggling with reading, another route of instruction needs to take place. One practical option for students under these to conditions is for instructors to use computer-assisted instruction (CAI) as an instructional format. CAI with repeated instruction has been found to have a positive effect on students with learning disabilities to help improve their reading skills (Stetter & Hughes, 2011). In many scenarios the drill and practice
delivered through the computer has made an overall educational difference for students (Stetter & Hughes, 2011). When students are using a computer program in the classroom for extra assistance, it allows the teacher to focus more on other tasks that need to be completed with other students in the classroom (Gibson Jr, Cartledge, & Keyes, 2011).

Bennett (2014) conducted a study using computer software to deliver reading intervention. The computer software was in the development, which meant the CAI was not yet completely developed; therefore human aid was still necessary. Humans were needed to provide prompts to participants on each step during intervention based on their performance. In addition, the experimenters detected and calculated reading errors, correct words read per minute and provided corrective feedback. During the listen to me phase of intervention, students could click on unknown words and listen as the computer provided the correct pronunciation. This computer feedback aided with fluency during practiced passages. The alternative process was for the experimenter to wait 3s before providing the correct pronunciation for omitted or mispronounced words. Therefore this led me to the conduction of my study; to determine the effects of the computer software as it was created more so for participants to use independently; without as many prompts coming from the researcher and participants being able to practice unknown words with computer prompts. The CAI was a beneficial factor in this study because the participants made progress in their fluency and comprehension.

Stetter and Hughes (2011) conducted a study to determine the effects of computer-assisted instruction on reading comprehension in an urban high school in the
United States. Participants were 9 students, ages 14 to 15, with learning disabilities in reading. Before intervention, they were given the Gates-MacGinitie reading comprehension test to measure their comprehension skills. The intervention consisted of 35 stories a story map to complete and comprehension questions to follow. All students in the baseline group showed progress when given the Gates-MacGinitie comprehension post-test. “These findings suggest the daily readings on the computer, rather than the comprehension strategy itself, might have influenced students’ reading comprehension” (Stetter & Hughes, 2011, p. 88).

Huffstette, King, Onwuegbusie, Schneider, and Powell-Smith (2010) focused on a study using Headsprout, a computer-based early reading program, on increasing oral language and early reading skills of preschool children showing risk. Before intervention began a pretest was given to measure the participants early reading skills and oral language skills using, Test of Early Reading Ability and Test of Language Development-Primary. One group of children received intervention using the Headsprout program and another group of children received intervention using Millie’s Math House. The lessons taught through Headsprout are centered on phonemic awareness, oral reading, reading comprehension, vocabulary, and the use of sound elements to decode words, understand meaning from text, and print awareness; included in the intervention as well were cards with words and their sounds on them that were taught during the intervention and participants had the opportunity to read printed stories for extra practice. The participants in this study received intervention for 30 minutes a day for 8 weeks. The results of the
study show that participants using the Headsprout program made greater gains in early reading skills and in oral language skills (Huffstetter, King, Onwuegbusie, Schneider, & Powell-Smith, 2010).

Second, Gibson, Cartledge, and Keyes (2014) conducted a study to determine beneficial effects of the Read Naturally Software Edition on urban African American first graders. Urban learners in city school districts lack the resources to better help them succeed in school, technology in the form of a computer-assisted reading program would be more reasonable for school usage (Gibson et al., 2014). The students included in the study also showed difficulty in reading fluency and reading comprehension. Students worked independently on either a laptop or desktop computer. They were trained on how to use the program and they used this program three to four times a week. The program consisted of key words (which were taught to the student), 1 minute cold read, read along, practiced repeated readings, comprehension test, and reading checkout. All of the stories read by the students during this intervention were on their instructional reading level. The results showed that all of the students increased their scores of correct words read per minute when comparing pre and post-test of the DIBELS spring benchmark. They also made gains on their reading comprehension as well and seven of the eight students raised their reading growth rate. The findings of this study show that computer programs can be of great assistance for African American students who show risk and are low preforming.

Although the findings from this study showed that the participant improved their fluency skills and reading comprehension, there is a need for researchers to explore more
programs to close the achievement gap between African American students and their peers. Culturally relevant practices could possibly be included in an intervention to benefit African American Students with reading skills (Gibson, Cartledge, Keyes 2011).

**Culturally Relevant Material**

Culturally relevant (CR) teaching is defined as “a pedagogy that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes” (Coffey, 2008). The population of the United States is rapidly becoming more culturally diverse (Coffey 2008). Students will enter their classroom with cultural differences and with a variety of social class backgrounds that is necessary to include in instruction to accommodate these individuals, including “cultural awareness, identifying pedagogical approaches, and adjusting curriculum content” (Cartledge & Kourea, 2008, p. 351).

According to national data pertaining to students who are culturally and linguistically diverse they have high rates of dropping out of school, being placed in special education although they may not need to be, not meeting state and national standards, and overall low outcomes in schools (National Research Council, NRC, 2002; Wagner & Cameto: Cartledge & Kourea, 2008). Often times students are achieving at a lower rate in school and attain less education (National Center for Education Statistics, 1990). Therefore, CR teaching may be important to empower students intellectually, socially, and emotionally (Coffey, 2008). It is essential that students from an ethnically diverse population receive quality instructional programs to decrease low academic
performance, referrals for special education, and events where students may receive
disciplinary action repeatedly (Cartledge & Kourea. 2008). Many people studying
culturally responsive instruction believe that the lack of success in school occurs from
conflicts of cultures between the home and school. If students are taught connecting their
background knowledge and experience to lessons, this could help improve their academic
success, aid with maintaining cultural competence, and help students to develop a
consciousness in which they are able to analyze cultural norms and values by not solely
attending to the society’s perception (Coffey 2008),

Researchers have completed studies to compare the results of using CR stories to
help improve reading fluency and comprehension. Students have shown to be successful
when they are able to relate to what is being taught in their academics. For instance, a
study completed by Bell and Clark (1998) included African American participants in
elementary school, grades one through four. For the purposes of the study, the stories
used included Black and White characters, and sociocultural themes centered on Euro-
American culture and African American culture. The dependent measures included
monitoring recalling and comprehension skills. The students were presented with a story
on audio and followed along with the story as read aloud on the cassette tape. After the
story ended the experimenter asked the students general recall questions about the story
such as “Who was the story about?” “What happened in the story?,” “How did the story
end?”, and if there was anything the student wanted to discuss about the story. In addition
to these questions the student was asked comprehension questions pertaining to the actual
story. Results from this study showed that African American students were able to better connect with stories that were relevant to their culture. Participants were better at comprehending stories that included African American characters and culture. This shows that students are able to engage in reading content that they can relate to.

Bennett (2014) conducted a study using culturally relevant material through the use of CAI and RRI. The study included second graders from an urban school setting who showed risk for reading failure. The intervention involved RRI of CR stories delivered through computer software. During the intervention, fluency and comprehension of stories read were measured as well as the student’s capability to generalize reading skills to novel passages. The first step of the intervention was “Read to me,” during this step the computer reads the assigned story to the student, next they would read along with the story, the next step involved having three opportunities to reach their goal on a “listen to me” timing where they would read the story for one minute. If they met their goal on the “Listen to me” phase the student moved along to “Time reading,” which served as a one minute treatment probe. After the students completed the “Time reading” phase the next phase included a maze to assess their comprehension of the story read. If the participant did well on meeting their goal on three consecutive culturally relevant stories the researcher administered a generalization probe, to see how well their reading skills transfer. The result of this study shows that when the students practiced the culturally relevant stories through repeated readings they all
reached their fluency goal. All seven students in the study were also able to increase their reading skills on generalization passages. Most compelling is the growth in comprehension on both CR passages and generalization passages. Participants in the study made improvements on their reading passages and maze comprehension assessments when baseline, intervention, and treatment probes were assessed (Bennett, 2014).

Bennett’s (2014) study was done with second graders only. Given that it is important to introduce and practice literacy skills with students in primary grades, my study included participants in first grade, to determine the effects of culturally relevant passages delivered through computer software on their fluency and comprehension.

**Purpose of Study**

Reading achievement scores for urban fourth grade students have been chronically low. Specifically, minority students from urban populations have been reading below grade level and there has not been a significant change in reading scores since 1992. Further, repeated reading interventions paired with CAI, and CR materials have shown to improve reading fluency skills and comprehension skills of students. The purpose of this study was to examine a multi-component intervention that embedded culturally relevant material within a repeated reading intervention delivered on an updated version of specially created computer assisted instruction that focused on errorless learning and independence of Reading Relevant R.A.C.E.S. Specifically, this study was designed to answer the following research questions:
1. What effect will a repeated reading intervention (RRI) using culturally relevant (CR) passages delivered through computer software have on first-grade urban learners’ ability to read correct words per minute (CWPM) of?

2. What effect will a RRI with CR passages delivered through computer software have on the generalization of ORF to novel AIMSweb passages for first-grade urban learners?

3. What effect will a RRI with CR passages delivered through computer software have on the reading comprehension of practiced CR passages for first-grade urban learners?

4. What effect will a RRI with CR practiced passages delivered through computer software have on the reading comprehension of generalization passages (AIMSweb) for first-grade urban learners?

5. What effect will a RRI with CR passages delivered through computer software have on the maintenance of comprehension on generalization passages (AIMSweb) for first-grade urban learners after intervention?

6. What effect will a RRI using CR passages delivered through computer software have on the generalization of ORF skills on a cold read of CR passages for first-grade urban learners?

7. How many verbal/physical prompts were necessary for the participants to use the computer software independently of researcher prompts according to the procedural integrity checklists?
8. How satisfied will participants be with the RRI delivered through computer software for increasing ORF in first-grade urban learners?
Chapter 2: Method

Participants and Setting

Participants for this study were recruited from an urban public school located in a large Midwestern metropolitan area. This is a community school that serves the families and children in the area surrounding the school. According to the School’s State Report Card (2014), the student population was 85.2% Black/Non-Hispanic, 7.0% White/Non-Hispanic, 5.3% Multiracial, and 81.8% economically disadvantaged. The school received an “F” for overall progress, a “C” for students identified as the lowest 20% in reading and mathematics and an F for lack of progress for closing the achievement gap. For the 2013-2014 academic year, the school documented that only 17.4% of students reached proficiency on the 3rd grade Ohio Achievement Assessment (OAA). There were two first-grade classrooms in the school. Four participants were selected for this study from one of the two first-grade classrooms.

Participants selected for this study evidenced decoding proficiency yet reading risk due to low level of oral reading fluency. Teachers administered an iReady Diagnostic and Instruction assessment (http://i-ready.com/product.asp) diagnostic assessment which is an online assessment that is individualized per student, and administered to determine skill level of reading and math on the Common Core. After the assessment was administered teachers recommended students to participate in the Reading R.A.C.E.S.
For students with parent permissions, the researchers administered the Dynamic Indicators of Basic Early Literacy Skills Next Edition (DIBELS; Good & Kaminsky, 2011) first-grade fall benchmark assessments and the Woodcock Reading Master Test-Revised (WRMT-R; Woodcock 1987 content &1998 norms) to determine which students were eligible for the Reading R.A.C.E.S. intervention. Participants needed to score at or below benchmark range (a minimum of 43 or lower) on the DIBELS NEXT phoneme segmentation for first graders and below or well benchmark range (a minimum of 23 words or lower) on the DIBELS NEXT Oral Reading Fluency (ORF). Finally, researchers administered the Woodcock Reading Mastery Test-R (WRMT-R) (Woodcock, 1998) to participants who were at or above benchmark range on the two DIBELS subtests. To be eligible for participation, participants were expected to read at or above the 50th percentile on the word attack subtest and at or below the 30th percentile on the word identification subtest.

The study took place in the community room located in the school. Each session included 1 participant and 1–2 researchers. There were 3–4 sessions a week with each session lasting 20–30 minutes. Participants were in intervention for 7–13 weeks. A summary of participant information including pseudonyms, age, race, gender, school, and DIBELS scores can be found in Table 2.1.
Materials

**DIBELS NEXT.** Screening measures consisted of two sub-tests of the DIBELS NEXT: Phoneme Segmentation and ORF. DIBELS NEXT consisted of formative assessments designed to measure basic early literacy skills and can be used with children in grades kindergarten-third grade. The phoneme segmentation subtest measures the participant’s ability to segment words into individual sounds. The DIBELS ORF measures the participant’s accuracy and fluency with text and the ability to translate letter sounds to sounds and sounds to words. Assessments procedures prescribed by the DIBELS NEXT authors will be followed.

Reliability data for each sub-test is reported as an indicator of how reliable the scores are. The reliability data show to be consistently high across all forms of reliability. The subtests include Phoneme segmentation fluency and DORF Words Correct per Minute. Dibels Next reliability estimates are represented for 1st grade under two different types of reliability, Alternate form and Inter Rater form.

- Alternate form reliability for phoneme segmentation is .78 and for DORF the coefficient is .95.
- Inter Rater Reliability for phoneme segmentation is .95, and for DORF the coefficient is not reported.

Criterion-related validity for First grade DIBELS measures include the general outcome measure. The general outcome measure includes Grade Total Test and DIBELS Composite Score. For the subtest Phoneme segmentation under Grade Total Test the
coefficient is .33 and the DIBELS composite Score is .25. For the DORF subtest, under Grade Total Test the coefficient is .75 and the DIBELS composite Score is .83.

**Woodcock Reading Mastery Test- Revised (WRMT-R).** Screening measures consisted of two sub-tests of the WRMT-R: word ID and word attack. The WRMT-R was designed to evaluate the reading levels of people that take this test. The word attack subtest consists of a list of nonsense words that the participant read in order for the researcher to assess their phonetic decoding skills. Word ID consisted of the participants reading a list of words that increased in difficulty. The participants must pronounce and decode the words correctly in order for their answer to be considered correct. Assessment procedures prescribed by the WRMT-R authors will be followed. Age equivalent scores and percentile rank will be derived from the raw scores for each student on both WRMT-R subtests.

Reliability data for each sub-test is reported as an indicator of how reliable the scores are compared to population norms. These data are reported as median reliability coefficients (r11) and median standard errors of measurement (SEM) for selected groups (i.e., Grade 1 and Grade 3, but not Grade 2). Reliability coefficients and standard error of measurement were reported for the following sub-tests at the first-grade level for forms G and H collectively: passage comprehension r11 = 0.97 and SEM = 4.2; letter-word identification r11 = 0.90 and SEM = 3.6; word attack r11 = 0.97 and SEM = 3.5.

**Culturally relevant passages.** This study is a replication of a previous study (Bennett, 2014) that described the development of the CR passages. See Appendix A for
a list of stories and their Space Readability Levels. See Appendix B for an example of a CR reading passage. All participants read through all 1st grade stories and began practicing 2nd grade stories by the end of the 3rd month into intervention. One participant began reading 2nd grade stories April 24th and the other three began reading second-grade stories April 29th.

**Generalization passages.** The generalization passages were taken from AIMSweb (aimsweb.pearson.com). AIMSweb is a curriculum based management (CBM) system that provides for screening and progress monitoring of basic academic (i.e., reading, language arts, math) skills. The researchers view these passages as non-culturally relevant (NCR) because the narratives are not specific to urban settings or common themes, even though the passages do contain content of interest to this grade level. Passages were chosen based on grade level difficulty (1.5–2.3) as measured by the Spache readability formula (http://www.readabilityformulas.com/free-spache-readability-test.php). Eight kindergarten stories, and nine first grade stories were used in this study. The researchers organized the AIMSweb stories according to difficulty and presented them in order of increasing difficulty (See Appendix B for a list of the stories used, the published grade level difficulty, and the Spache Readability Level).

**Headset.** Participants used a headset with a noise-cancelling microphone during the intervention. The headset with a microphone was used so that participants could listen to the stories with limited distractions and so that the computer would create an audio recording of the students’ oral reading. The participant had the opportunity to listen to the
story being read through Reading R.A.C.E.S. as well as instructions during the intervention session.

**Researcher-Developed Software.** A CAI application was used to deliver a RRI to first-grade participants. Two Toshiba laptops were used to deliver intervention. A unique and important feature of the software is that it allows the teachers/researchers to add custom stories to the story bank. The stories used for this study were the CR stories previously discussed. The program allowed and prompted participants to listen to a human voice model, read with that model, and had the capability to “listen” to participants as they read independently. The CAI has the capability to calculate total words read (TWR) on one-minute timings based on voice recognition during these independent readings; participants then verify the last word that they actually read by clicking on the word. Since the CAI only recognizes misread words if the participants clicked on a word during any of the “Listen to Me” phases, the researcher assisted with this phase. After the participants verified the last word read, the error correction screen appeared next. If the computer did not recognize words misread by the participant, the computer then generated a CWPM score and displayed it for the participant. During intervention while the participant is reading practice passages, the CAI can provide assistance with unknown words (i.e., reading the word) when a participant clicks on the unknown word or when there is 3s pause. After each phase of the intervention, the computer gave supportive statements motivate students and to promote a growth mindset.
Definition and Measurement of Dependent Variables

There were seven dependent variables in this study: correct words per minute (CWPM) of orally read CR passages, CWPM of orally read AIMSweb generalization probes, correct responses to questions in the corresponding CR mazes (comprehension) during a 3-minute timing, correct responses to questions in the corresponding AIMSweb generalization mazes (comprehension), maintenance of fluency and comprehension 1-week after intervention had been completed, CWPM on cold reads of CR passages, and participants’ independence in correctly interacting with the computer software (i.e., following the researcher’s procedural integrity checklist).

Correct words per minute (CWPM). CR passages were presented to participants on the computer during 1-min oral reading timings after they had practiced reading the passage and had demonstrated the ability to reach their oral reading aim. A word was counted correct when a participant accurately pronounced it within 3-seconds of the previous word being read. A word was counted as incorrect if the participant omitted or mispronounced the word or failed to read it within 3-seconds. Additions (i.e., adding or repeating a word) and self-corrections were not counted as errors. After the timed reading, in addition to researcher assistance, where the researcher would highlight students errors on the reading errors screen because the CAI did not recognize errors if the participant did not click on an unknown word for assistance. The CAI software then stated how many correct words the participant read whether their reading goal has been met or not. However, the CAI gave corrective feedback after a timed reading if the
participant has failed to reach his/her goal after intervention by reviewing words that were misread. The CAI would say the word that was read incorrectly and ask the participant to repeat the word. After the student repeated the word the computer read the entire sentence in which the misread word was located and asked the participant to repeat the sentence. The same procedure took place for every mispronounced word.

**CWPM on AIMSweb generalization probes.** The second dependent variable was CWPM on AIMSweb generalization probes. The participant was given a generalization probe (i.e., previously unseen passage) after two to three successfully completed CR timed readings (i.e., the participant met his/her orally reading goal). If the participant took more than one session to meet their fluency goal for two consecutive practice passages, the generalization probe was given after five CR timed readings. The novel AIMSweb passages were presented on the computer using the same procedures used for 1-minute timing of CR passages. The same rules used to determine reading accuracy for CR passages was used for the generalization passages.

**Mazes.** The third dependent variable was correct responses to forced choice questions in corresponding CR mazes (i.e., comprehension) during a 3-minute timing. A maze was included for every seventh or eighth word if the word was not a proper noun, an article, or one part of a compound adjective or other hyphenated word. The computer scored a maze comprehension question as being correct if the response given by the participant matched the answer key and scored incorrect if it did not match the key.
Corrective feedback was not given after the maze assessment. The computer software plotted the data from these two treatment probes on a maze graph shown after the maze was completed. The researcher also plotted the data from these two treatment probes on a graph generated by Microsoft Excel after the session.

**Comprehension of generalization passages.** The fourth dependent variable was the comprehension of the generalization passage. Correct responses to maze questions on the AIMSweb mazes on the computer were recorded following the generalization probe. The set up of the AIMSweb maze on the computer is similar to the CR maze 3 minute timing. The same rules were used for accuracy of the CR mazes. Similar to the treatment probes, generalization probes were plotted on a graph created in Microsoft Excel.

**Maintenance.** The fifth dependent variable was the maintenance of fluency and comprehension 1- week after intervention was completed. Participants’ total CWPM were recorded while reading AIMSweb oral reading passages and correct responses to questions during AIMSweb mazes. These data were collected using the same procedures during the generalization assessments.

**Cold reads.** The sixth dependent variable was CWPM on cold reads of CR passages. Participants read each CR passage as a “cold-read” for a 1-minute timing, without practice before beginning the stages of intervention. CWPM on CR cold reads were plotted on a graph to measure the generalization of fluency skills to novel CR passages.
Participant independence. The seventh dependent variable was the users’ independence when interacting with the computer software. After initial training sessions, the researcher calculated how many verbal prompts were necessary for the participant to correctly interact with Reading R.A.C.E.S according to the researcher created procedural integrity checklist. Verbal prompts included the researcher actually voicing a step that the participant needed to take to assist him/her during the intervention. Refer to Appendix D. for list of prompts.

Independent Variable

The independent variable was the researcher-designed repeated reading application with CR passages delivered through voice-recognition software with a human voice model, known as Reading R.A.C.E.S. Each participant was trained to use Reading R.A.C.E.S independently and then received intervention approximately three to four times per week. Each participant individually worked on the Toshiba laptop provided. The program consisted of the follow sequence:

- Setting of the ORF goal and mind growth (i.e., encouraging positive practice to promote academic performance),
- Begin (i.e., the participant read the assigned CR story before intervention began as a cold read, for a one-minute timing),
- Reading errors screen (i.e., Computer software showed a screen with words the participant misread)
• Practice Words (i.e., the computer practices researcher selected words after Cold Read. Followed by actual errors after Listen to Me.),
• Read to me (i.e., the computer reads to the participant),
• Read along (i.e., the participant reads with the computer with computer assistance for unknown words),
• Listen to me (i.e., the participant reads independently for up to three one-minute timings with computer-assistance for unknown words),
• Reading errors screen,
• Timed reading (i.e., one-minute fluency timing),
• Reading errors screen,
• Maze comprehension passage, and
• Charting the Data

Refer to Appendix E for procedural checklist that was used to teach participants how to use Reading R.A.C.E.S.

**Experimental Design and Conditions**

Concurrent multiple probe experimental design across participants during intervention was used for this study. All participants started baseline condition at the same time. The participant with the lowest ORF scores and stabilized baseline data entered intervention first. If the first participant’s treatment probes, showed an increasing trend on ORF for practiced passages, (i.e., CR treatment probes), then the next participant
entered intervention, and so on. Once baseline data were stable for CWPM on CR and AIMSweb passages, the first participant entered intervention. After the first generalization probe, the participants’ CWPM CR timed reading data was assessed to determine if there were any trends for increasing CWPM and decreasing errors. When there was an increasing trend on the generalization measures, then the next participant entered intervention, and so on. All active participants were entered into the intervention condition 3-4 weeks after the baseline condition was completed. Intervention lasted from 7–13 weeks, which was dependent on each participant’s performance.

**Procedures**

**Screening.** There were four tiers in this study and one participant was placed in each tier. There were a total of four participants in this study. Both DIBELS subtests (phoneme segmentation and ORF) and WRMT-R (Word ID and Word Attack) were administered to each participant. Tier placement was determined by the participants that showed the greatest need, having the lowest score overall on both pre-test.

During the phoneme segmentation students were first given examples of real words to practice segmenting sounds. After the practicing segment the participant was asked to segment sounds in a word after the researcher said the word. Participants received a point for each sound stated correctly in the word. During the DORF segment the participants were asked to read a passage for 1 minute. While the story was being read, the researcher kept track of any omissions and mispronunciations and marked those as errors. If a participant was not able to pronounce a word the researcher stated the word
and marked it as incorrect. The total number of words read was recorded, errors (including omissions and mispronunciations) were subtracted from total words read, and t CWPM was calculated.

The participant in Tier 1 (MaKayla) scored a 46 on the DIBELS phoneme segmentation demonstrating that she did have functional decoding skills. On the DORF measure her mean was 7 correct words per minute (CWPM), demonstrating that she was well below benchmark. On the Word ID she fell in the 54th percentile rank and Word Attack she fell in the 64th percentile.

The participant in Tier 2 (Kareem) scored a 48 on the DIBELS phoneme segmentation demonstrating that he was able to functionally decode words. On the DORF measure his mean was 14 CWPM, demonstrating that he fell way below benchmark as well. On the Word ID he fell in the 55th percentile and on the Word Attack subtest he fell in the 73rd percentile.

The participant in Tier 3 (Kiara) scored a 46 on the DIBELS phoneme segmentation and her mean on the DORF assessments were 19 CWPM, yet demonstrating that she was well below benchmark. On the Word Id she fell in the 88th percentile and the 67th percentile for Word Attack.

The participant in Tier 4 (Layla) scored a 29 on the DIBELS phoneme segmentation, which was interesting because she scored the lowest out of all participants making her below benchmark. On the DORF measure her mean was an average of 21
CWPM, placing her below benchmark but higher than her intervention peers. On the Word ID she fell in the 88th percentile and 84 percentile for Word Attack.

The researcher administered all screening measures to the participants individually. Assessment procedures and scoring guidelines prescribed by the tests manuals were followed precisely. Students who qualified from the above screening measures were placed into baseline, the four students who showed the greatest need for intervention were chosen to participate in the study.

**Baseline.** Baseline consisted of alternating cold reads on three AIMSweb passages (i.e., the NCR passages used for generalization) and three CR passages delivered on the computer. A cold read was considered to be a novel (i.e., not previously seen/read) passage that the participant attempted to read independently. The participants listened to the instructions delivered through the computer. The computer instructions were stated as follows.

“Hi I am Betty Buckeye. I am going to read a story to you. As I read a word it will turn blue, making it easier for you to follow along. After I read, please read with me. Then you will practice reading the story by yourself for 1-minute. When you read to yourself, I will listen. You should do your best reading. I may ask you to practice by yourself several times to help you reach your goal. Exercising our brain helps us to learn. Practicing our reading is a way to exercise our brain so we can become better readers. Are you ready to begin (click “yes” or “listen again”)?”
After the computer read these instructions the participant was prompted to find the story and click on the “Begin” button. Once the participant clicked “Begin” they were able to read the passage as the researcher followed along on a duplicate passage to record errors using a pencil/pen. The three generalization passages were read using the ORF software and the participant wore the Logitech headset so that a voice recording was obtained. While the computer listened to the participant read, the researcher followed along on a paper copy of the story to record data. For all passages, data were collected on participants’ errors, CWPM, and number of items scored correct and incorrect on the maze comprehension passage.

**Training.** During the session immediately preceding intervention, participants were trained on how to use the computer and the ORF software. A graphic organizer was shown and read to the participants during training to explain the rules during intervention (Appendix F). A CR example story that was not a part of the fluency training stories was used (i.e., the 26th ranked CR story). The researcher used a training checklist to train participants. All participants met the predetermined training criterion after one training session (i.e., being able to demonstrate all of the skills in the correct sequence), except one participant. Fluency goals for intervention were pre-determined for each participant during the training session based on their baseline scores on CR and NCR passages. She surpassed her pre-determined goal selected by the researcher, so her goal was increased on the next training story. During the training, the participants were not required to meet a fluency goal.
**Setting of the goal.** According to DIBELS Next the oral reading fluency at which participants (i.e., first graders) are expected to read at the beginning of the year is not measured but they are expected to read 23 + CWPM by the middle of the year and are expected to read 47 + CWPM by the end of the first year. The software allowed goals to be set in increments of five from 20–120 CWPM. The researcher set the participants’ goal in the computer according to performance data (either 20, 40, or 60). The 40 CWPM and 60 CWPM goals are slightly higher than the midyear and end of the year benchmark goals respectively set by DIBELS NEXT to encourage transfer of ORF skills to generalization passages (i.e., AIMSweb). If the participant’s baseline was below 40 CWPM, the participant was given a goal of 20 CWPM; if the participant’s baseline was above 40 CWPM but lower than 60 CWPM, he/she was given a goal of 60 CWPM. Participants that read well below benchmark had goals set at 20 and were increased by 5 as they met their goals. If the participant continued to fall short of his/her goal, his/her goal was cut back by 5. If the participant’s goal was 20 CWPM or 40 CWPM, the computer automatically played the model story at 40 WPM. If the participant’s goal was 60 CWPM, it played the story at 60 CWPM.

Each participant was shown his/her baseline data (printed on paper) and goal before the CAI session began (Appendix G). The participants put the headphones on and logged into the computer by finding his/her initials. The researcher reviewed either baseline data (for the training and first session) or the previous day’s data on the computer generated graph and had the participant select the appropriate goal.
The human voice model read the first-grade stories at 40 CWPM or 60 CWPM. If a participant had a goal of 40 or below, the voice model read the story at 40 CWPM; if a participant had a goal of 45 or above, the voice model read the story at 60 CWPM. The 40 CWPM and 60 CWPM goals were slightly higher than the benchmark goals set by DIBELS NEXT to encourage transfer of ORF skills to generalization passages (i.e., AIMSweb).

**Getting Started.** The computer prompted the participant to find his/her name in the drop down menu labeled “Student Name.” Then, the computer prompted the participant to click on the “Listen” button where the computer explained the sequence of the intervention. The computer read the same directions to each participant at the beginning of each session. After the introduction, the computer prompted the participant to click on “Yes” if he/she was ready to begin the intervention session or “Listen Again” to read/hear the instructions again.

Next, the computer displayed a graph showing a horizontal red line along the participant’s goal and timed reading scores. The computer stated “Your goal is _____, see the red line? The last time you read, you scored_____ see it on the graph? Let’s see if you can reach your goal today. The participant was prompted by the researcher to raise his/her hand when a graph was shown so the data could be recorded and to click “OK”. The graph was also displayed after each participant’s timed reading and maze. After the participant completed the maze a graph was shown with the participant’s maze scores and
stated “Here are your scores on the mazes you have completed, click on “OK” when you are finished.”

Finally, the computer prompted the participant to select the assigned story for that day in the dropdown menu and click on the “Begin” button to start with a cold read of the assigned story. The 25 CR passages were divided into five sets of five stories. Each story was put into a randomizer to determine the order the participant would read the stories. Then the researcher prompted the participant to select the chosen story for the day from the dropdown menu. There was one expository text in each set except one; the remaining passages were fictional.

**Cold Read.** After the participant selected the correct story and clicked the “Begin” button the computer read the following directions for this button. “First let’s see how well you can read this story for a minute. Remember to do your best and a smoothest reading. Start reading as soon as I say, ‘GO!’ When you are ready, click on ‘OK.’” After the computer read the directions to the participant, he/she read the selected story for one minute. After one minute the computer timer sounded and the computer told the participant to click on the last word they read and following was a reading errors screen with words highlighted that the participant missed. It also allowed the participant to highlight any other words that they missed by prompting them to click on the words and providing the proper pronunciation of each word that was missed. In this case the researcher clicked on words that the participant missed. Next, the computer told the participant how many words he/she had read. If the participant meets/exceeds his/her
goal the computer read “Congratulations! You read _____ words per minute. Your goal is ____ words per minute. You reached your goal without even practicing! Click on the ‘OK’ button.” The participant was prompted to click on the Time Reading button. If the participant reads fewer than his/her targeted goal, the computer read, “Very nice! You read ____ words per minute. Your goal is _____. With a little practice I think you can reach your goal. Click on the ‘OK’ button.” Next, if the participant clicked incorrectly on the last word read, the researcher was able to right click on the last word read by the participant.

**Reading Errors Screen.** After the participant read the Cold Read for one minute the computer stated “The words you missed I noticed are highlighted, highlight any other words you missed by clicking on them.” The words misread were highlighted in yellow, the computer said the word, and the participant repeated the word after the computer. Once all unknown words were practiced the words were saved and a screen appeared stating “Congratulations! You read ______ correct words per minute. Your goal is ______ words per minute. You reached your goal without even practicing!

*When you are ready, click on ‘OK’* if the participant met their predetermined goal. If the participant did not reach their goal the computer stated “Very Nice! You read _____ correct words per minute. Your goal is ______. With a little practice I think you can reach your goal. Click the ‘OK’ button”.

**Practice Words.** After the participant read the story for one minute the computer prompted the participant to click on the “Practice Words” button, the pre teaching
feature. Practice words were preselected by the researchers, which included words that students seemed to have the most issues with in a previous pilot study. The computer stated the word “*This word is _____, say _____*” and gave the participant the opportunity to say the word, and then the computer provided a sentence using the word and asked the participant to read the sentence by stating, “*Read the sentence*”. The computer provided 3-4 words within each story. After the pre-teaching feature was completed the computer prompted the participant to click on “Read to me.”

**Read to me.** After the participant practiced the vocabulary for the selected story the computer prompted the participant to click on the “Read to Me” button. The computer read the following directions to the participant “*Now you will listen as the story is read. Follow along as the words are highlighted in blue.*” After he/she clicked “ok,” the computer then played the human voice recording for that particular story that corresponds with the participant’s goal speed (i.e., 40 or 60 CWPM). The blue-highlighting feature kept pace with the voice recording. The participant may have been prompted by the researcher to follow along with the story if their attention appears to be fading.

**Read along.** After the story was completed, the computer prompted the participant to select the “Read Along” button. Just as in the “Read to Me” condition, the computer read the following directions. “*Now you will read along as the story is read. Make sure to read loud and clear into the microphone. If you need help, you can click on the word and I’ll stop and say the word. Then we will begin again from the beginning of the sentence. After I read the title you can begin.*” When the participant clicked on a
word that they needed help with the computer said the word and began reading from the beginning of the sentence during the Read Along. After the participant clicked “ok”, the computer then played the pre-recorded human voice recording for that particular story at the participant’s goal speed (i.e., 40 or 60 CWPM). This phase is similar to read to me except for the computer read the story to the participant again and the participant was prompted to read aloud with the voice model.

**Listen to me.** After the participant has finished reading with the voice model, the computer prompted the participant to select the “Listen to me” button. During this phase of intervention, the computer read the following directions to the participant.

*Now you will read alone for one-minute. Your goal is ____ words per minute. I know this is high, but you have been practicing, and I know you can do it. If you have trouble, I will help you to reach your goal. Please make sure you say every word clearly so we can hear all the words you say. Do your best and smoothest reading; if you get stuck on a word try to sound it out; if you are really stuck, click on the word and I will help you. At the end of the minute, we will practice any sentences that you had trouble reading. We may do a total of 3 one-minute timings.*

If the participant did not meet his/her goal after the first “Listen to Me” the computer read the following directions to the participant.
“To reach your goal you need to read to the highlighted word.”

The computer showed the participant the word that needed to be read in order to reach their goal by highlighting it.

The participants had a chance to practice three one-minute timings, in order to reach their set criterion with 90% accuracy. Just as in “Read Along” if a participant did not know a word and paused for 3 seconds, he/she was prompted to click on the word and the computer provided the word. At the end of the 1-min timing the computer told the participant to click on the last word that he/she read. The computer then showed the reading errors screen by showing words that were misread during the 1-min timing. The computer then displayed the CWPM to the participant. If the participant did not reach his/her goal, the computer stated, “Your goal was _____. You read _______ words per minute. Good try. You just need more practice. Please try again, I think you can get closer this time!” The computer then prompted the participant to click on “Listen to me” again. If the participant reached his/her goal and read the passage with 90% accuracy, after clicking on the last word they read, the computer prompted the participant to click on “Timed Reading” “Congratulations! Your goal was 60. You read _____ words per minute! Now, you can click on Timed Reading.”.

If a participant did not qualify for the timed reading after three listen to me trials, the session ended and the participant started the listen to me phase over with the same story the next session. If a participant did not reach his/her goal after two days, the goal was systematically lowered for the third day. In this case, the goal was re-set to a
criterion that was more attainable for the participant. To systematically lower a participant’s goal, researchers sliced back the goal by 5 CWPM. For example, if a participant’s goal was 60, his/her goal was sliced back to 55. Once the participant reached the new goal, the goal was raised to the previous level (e.g., 60) the next session. If an announcement or unexpected noise occurred during intervention (i.e., Listen to me or timed reading, the participant clicked the stop button to pause intervention. Once the noise came to an end the participant restarted the phase of intervention and this was noted on the researcher’s data sheet.

**Timed Reading.** The timed reading was known as the treatment probe. During this phase, the computer gave the participant one minute to read the practiced passage and the computer did not provide corrective feedback (i.e., participants were not able to click on unknown words or told a word after a 3-second pause). The following directions were displayed and read to the participant.

“Now let’s see if you can meet your goal on one more one-minute timing. Your goal is ___ words per minute. Remember to do your best and smoothest reading; Remember to start reading as soon as I say, ‘GO!’ When you are ready, click on ‘OK.’”

If the participant reached his/her goal, the computer read, “Congratulations! Your goal was ___. You read ___ words per minute! Now, you can click on the Maze button.” If the participant does not reach his/her goal the first time, the computer will read, “Your
goal was ___. You read ____ words per minute. Let’s try another timed reading and see if you can meet your goal.” If the participant did not reach his/her goal after the second Timed Reading the computer read, “Your goal was ___. You read ____ words per minute. You tried your best today, but let’s take a break. We can practice this again next time.” The researcher recorded errors made during the reading using a paper/pencil data sheet (see Appendix H) to calculate the errors and CWPM to verify the computer’s calculation. The participant was required to reach the specified goal on this timing in order to move on to the comprehension maze passage. If the participant did not meet his/her goal during this 1-minute timing, he/she was given a second chance to read it again. In total (including the read along, listen to me, and timed reading phases of the intervention) the participants had the opportunity to read the same story 5–8 times per session. The maximum number of times that one participant stayed on one story was three sessions (i.e., a participant practiced the same story no more than three days). A screen shot of an example is shown in Appendix I. If an announcement or unexpected noise occurred during intervention (i.e., Listen to Me or Timed Reading,) the participant clicked the stop button to pause intervention. Once the noise came to an end the participant restarted the phase of intervention and this was noted on the researcher’s data sheet. At the end of the Timed Reading session a graph was shown to display the participants CWPM read.

**Maze.** After the participant met his/her goal during the timed reading, the computer prompted the participant to select the “Maze Comprehension” button. The
computer gave directions and timed the participant for 3-minutes “You reached your goal! You can take the MAZE comprehension test. You will read this story to yourself. This time there are missing words. You will choose which word is correct and click on it. You will have three minutes to complete the MAZE. Click ‘OK’ when you are ready to begin.” The mazes assessed the participant’s comprehension on the passage that he/she read at or above the goal. There were approximately 11-15 response opportunities for each maze passage. Participants had three fill-in-the-bubble choices on the computer. The data taken by the computer served as a permanent product and the computer calculated the correct score. Mazes were only taken one time and a computer generated graph plotted the raw scores (correct responses) and displayed the participants scores after the maze. (see Appendix J for example). After the participant completed the maze, the computer stated, “Good effort, you got _____ correct.” Following was a graph that displayed the number of correct scores. After the student saw their Maze graph the computer prompted them to click the “Go Back” button to exit the session.

**Generalization probes.** After a participant met his/her goal on three consecutive CR stories, a participant read a generalization probe (i.e., AIMSweb). The number of errors and correct words read per minute were computed as generalization probes. If the participant consistently took more than 2 days to complete a story, he/she was given the generalization probe after a CR passage set of 5 was completed. After the participant completed the 1-min timing on the AIMSweb (i.e., NCR) passage, regardless of the
CWPM read, he or she was given a corresponding AIMSweb comprehension maze passage on the computer.

**Maintenance.** Following 1 week after the intervention ended the researcher asked each participant to complete one AIMSweb passage and 1 CR passage on the computer. Participants were also asked to read three DORF stories. This phase was identical to baseline with the exception that only one story was read. As in baseline, CWPM and items scored correct on the maze passage were graphed on the computer.

**Behavior management**

Participants’ behavior was reinforced in several ways. First, the computer displaying the results of CWPM will be used as a reinforcer. Second, the participant will immediately see his/her own progress when treatment and generalization probes are plotted. This was used to motivate and reinforce the participants. Third, when the participant reached his/her goal on a story, they were able to place a sticker next to the title of the story he/she read for the intervention session.

**Social Validity**

Participants were given a post-intervention questionnaire (See Appendix E). The participants were given a questionnaire including seven questions regarding how they felt about the CAI overall and stories that they liked and disliked.

**Interobserver Agreement (IOA)**

A second observer was present for a minimum 33% of baseline, training, treatment, generalization probes, maintenance, and social validity measures for each
participant (See Appendices K-N). Exact agreement was used, which is agreements divided by the number of agreements plus disagreements and multiplied by 100 and rounded to the nearest tenth, to calculate percentages. IOA was also calculated for 100% of the listen to me and timed reading phases of intervention to check the computer’s accuracy on CWPM (Appendix K).

**Treatment integrity**

To measure treatment integrity: The primary experimenter, the participants, and the computer’s performance were observed. In all instances, checklists were used to calculate a percentage of steps completed correctly.

**Primary experimenter.** Treatment integrity was calculated for at least 33% of each phase of the intervention and generalization probes given to the participants. Phase-specific checklists were used to calculate total percentage of steps completed (see Appendix L and Appendix M).

**Computer.** The software was still in the developmental stage; therefore, as the computer delivered the intervention, the primary experimenter used a checklist to assess treatment integrity at least 100% of the time. A second observer was present and used the same checklist during 33% of the sessions. IOA was then calculated between the primary and the secondary observers (see Appendix N).

**Participants.** As the participants operated Reading R.A.C.E.S to receive intervention, the primary experimenters used a checklist to assess treatment integrity across 100% of the sessions. A second observer used the same checklist to observe,
during 33% of the sessions. IOA was calculated between the primary and the secondary experimenters (see Appendix N).
Table 2.1
Participant Information.

<table>
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<tr>
<th>Name</th>
<th>Age&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Race&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Gender</th>
<th>DIBELS Next Scores BOY</th>
<th>Woodcock-Johnson Reading Mastery Test</th>
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<td></td>
<td></td>
<td>Phoneme Segmentation</td>
<td>Oral Reading Fluency</td>
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<td></td>
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<td>Raw Score (risk level)</td>
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<td>(Well Below Benchmark)</td>
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<td>14</td>
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<td>(Below Benchmark)</td>
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</tbody>
</table>

<sup>a</sup>Age: refers to the age of each participant in years and months at the time DIBLES Next Beginning of the Year (BOY) sub-tests were administered (09/30/2013)

<sup>b</sup>Race: refers to the racial background of each participant; AA= African American; MR= multi-racial

<sup>c</sup>Risk Level: In the order of Assessments listed (DIBLES Phoneme Segmentation & ORF)


Chapter 3: Results

This chapter presents the results of the study. Data are presented on interobserver agreement (IOA), treatment integrity, social validity, and participants’ reading growth measures. Further, for each participant, correct words per minute (CWPM) and correct responses to maze comprehension passages in 3-minutes for both CR passages and AIMSweb generalization passages are reported.

Interobserver Agreement

Primary experimenter. There was only one primary experimenter (a second year master’s student), who was previously trained during a pilot study to serve as both a primary experimenter and second observer for a previous study. Four students served as second observers (One master’s student, two doctoral candidates, and one undergraduate student). The second observers were required to achieve at least 90% treatment integrity and have at least 90% agreements for each phase and each measure to observe participants in this study. IOA was calculated during each phase of the intervention for each student using exact agreement. Agreements were divided by the number of agreements plus disagreements, multiplied by 100, and rounded to the nearest tenth, to calculate percentages. A second observer observed each student for at least 63% of each subtest during pre-post tests, 58% of baseline AIMSweb and CR passages assessments, 53% of intervention sessions, 50% of treatment probes, and 66% of generalization probes.

Aggregated IOA calculations for the four participants for each phase of the intervention are as follows: The IOA for the Woodcock Reading Mastery pre-tests was a
mean agreement of 96.7% (range: 94.7–100%) where data was collected on 100% of the subtests. During baseline on both the AIMSweb and CR passages, there was a mean agreement of 98.4.8% (range: 95.2–100%). IOA was collected across 58.3% of the sessions. For the treatment probes, 50.4% of the sessions had a second observer and the mean agreement was 99.7% (range: 92.6–100%). For the generalization probes 64.7% of the sessions had a second observer and there was 99.1% agreement (range: 80–100%). For the maintenance and generalization probes, 73.3% had a second observer, with 99.5% agreement (range: 98–100%). During intervention, for participant independence data 51.8% of the sessions had a second observer and there was a mean agreement of 96.4% (range 70-100). During intervention, for computer fidelity 51.8% of the sessions had a second observer and there was a mean agreement of 70.5% (range 0-100).

**Computer.** IOA was calculated for 50% of the listen to me 1-minute timings for each participant during the intervention phase to check that the computer’s accuracy on total words read (TWR). Out of each of the 34 stories 32 were checked for IOA at least once across the 4 participants. There was 40% agreement between the computer and the primary experimenter. There were constantly disagreements during the Cold Read and Listen to Me because the computer was not able to identify a mispronunciation if the participant did not click on the word.

**Treatment Integrity**

**Primary experimenter.** Treatment integrity was calculated for each phase of the intervention. Phase-specific checklists were used to calculate total percentage of steps
completed. The primary experimenter administered the Woodcock Reading Mastery pre-
tests and treatment integrity was calculated during 75% of the subtests. The average
primary experimenter treatment integrity was 98% with a range of 66.7–100%. During
baseline for both the AIMSweb and CR passages, 58.3% of sessions had a second
observer. The primary experimenter followed 92.8% (range: 66.7–100) of the steps.
During intervention, 53.5% of sessions had a second observer. The experimenter
followed 99.7% (range: 87–100) of the steps. During the treatment probes, 50.4% of the
sessions had a second observer. The experimenters followed 99.7% (range: 92–100) of
the steps. During the generalization probes 64.7% of the sessions had a second observer.
The experimenters followed 99.1% agreement (range: 80–100) of the steps. During the
maintenance and generalization probes the primary experimenter was observed during
73.3% of the sessions and 100% of the steps were followed.

**Computer.** The software was still in the developmental stage; therefore, as the
computer delivered the intervention, the primary experimenter used a checklist to assess
treatment integrity 97.1% of the time. A second observer was present and used the same
checklist during 43.1% of the sessions. IOA was then calculated between the primary
and the secondary observers. Overall, the mean agreement between the observers was
70.5% (range: 0–100%).

On average, according to the primary experimenter, the computer had 50%
treatment integrity. There were a few computer errors that affected treatment: For all
stories if the participant mispronounced a word but did not click on the word for further
instruction the computer did not recognize the error. Although the computer prompted the
students to click on a word after a 3 second pause, it would over prompt. If the
participant were to decode the word correctly the computer would continue to prompt the
participant to click on the unknown word, this happened across participants. Also, during
the error correction phase the computer did not allow enough time for participants to read
the entire sentence that included the misread word during intervention. It would skip to a
different word before the participant completed the sentence. For *Skating Party*, the error
correction was not displayed for one participant.

**Participants.** As the students operated the Reading R.A.C.E.S to receive
intervention, (the goal was for them to be able to use the software independently), the
primary experimenter used a checklist (See Figure 3.1 and 3.2) to assess treatment
integrity across 100% of the sessions. A second observer used the same checklist to
observe, during 51.8% of the sessions. IOA was then calculated between the primary and
the secondary experimenters. The aggregated means according to the experimenters
reveal that participants followed 94.3% of the directions given by the computer
(individual participants’ mean scores ranged from 60% to 100%).

One participant who consistently scored below 90% treatment integrity did not
use the software as designed in a variety of ways; therefore, disaggregated individual
results are further reported and discussed below under each participant’s subheading.
Overall, the mean agreement between the primary and secondary experimenters was
96.4% (with a range across participants of 70–100%).
Social Validity

After each participant completed his/her last intervention session (with the exception of MaKayla who did not return to school after her last intervention session), the researcher verbally asked social validity questions. In general, most participants said that they liked reading on the computer, they liked seeing their scores on the graph presented during the intervention, and they all thought they became better at reading. Two out of three students stated that they did not want to continue reading on the computer.

All three of the participants felt that they became better at reading new stories on the computer (i.e., AIMSweb). Two out of three of the participants felt that their classmates would like this program. The researcher reviewed each story’s title with the participants and asked them to provide the title of his/her favorite and least favorite story. Information gathered from this portion of the survey, as well as reasoning for answering affirmatively to the former questions can also be found under each participant’s subheading.

After the participants had completed the intervention their teacher stated that their confidence has really increased. She also indicated that Makayla (although she did not receive a survey) came to her and stated, “I can read now”!

Reading Growth Measures

DIBELS. As shown in Table 3.1, two DIBELS benchmark assessments, were given to the participants before and after intervention (MaKayla was not given a DIBELS
benchmark assessment because she did not return to school). The experimenter, one Graduate Research Assistant, and one Graduate Teaching Assistant who were previously trained to criterion during all phases of the project (i.e., pre-test, baseline, training, treatment, generalization probes, maintenance, and social validity measures) gave a middle of the year (MOY) benchmark assessment for phoneme segmentation and DIBELS Oral Reading Fluency (DORF) in December and January. These data were used to screen students for eligibility for the study.

The primary experimenter administered the phoneme segmentation and DORF assessment as a post-test measure of reading growth. The EOY assessments were given in May, in testing conditions that were different from the, baseline and pre-test setting. During baseline and pre-testing the experimenters used the art room (a larger room with an estimate of 5 tables and chairs on each side), instead of the room, which was used during intervention and post-test assessments. The room used during intervention and post-test assessments was a smaller tutoring room with one desk where the participant sat and another table where the experimenter and second observers sat.

Overall, only one participant (Layla) moved to “at or above benchmark” from “below benchmark.” Kareem increased his ORF by 13 words and Kiara increased her ORF by 24 words. MaKayla was no longer at the school so she did not participate in post-testing.

**Culturally Relevant Stories.** Participants were given CR stories during baseline. The primary experimenter administered all of the baseline probes. Baseline probes were
given in January in the small tutoring room previously mentioned. MaKayla was not at
the end of the year to compare pre-intervention and post intervention scores. CR
maintenance probes were given one week after intervention ended in May. Kareem read a
mean of 21 words during baseline 45 words during maintenance. Kiara read a mean of 20
words during baseline and 43 words during maintenance; Layla read a mean of 25 words
during baseline and 49 during maintenance.

Non-Culturally Relevant (NCR) Stories. Participants were given NCR stories
during baseline. The primary experimenter administered all of the baseline probes.
Baseline probes were given in January in the small tutoring room previously mentioned.
MaKayla was not at the end of the year to compare pre-intervention and post intervention
scores. NCR maintenance probes were given one week after intervention ended. Kareem
read a mean of 23 words during baseline and a total of 27 words during maintenance.
Kiara read a mean of 25 words during baseline and total of 55 words during maintenance;
Layla read a mean of 26 words during baseline and a total of 62 words during
maintenance.

Oral Reading Fluency and Maze Results

Individual results on CWPM (Figures 3.3) and maze responses (Figures 3.4) on
both types of passages (i.e., CR and AIMSweb) are reported below. Baseline and
intervention scores by mean and range on AIMSweb passages for CWPM and correct
responses on maze passages can be found in Table 3.2.
MaKayla

**CR CWPM.** MaKayla’s CWPM data on CR passages (Figure 3.3) shows that when she read novel CR passages on the computer during baseline, her mean fluency score was 13.6 (range: 4–23). The mean number of errors during baseline was 5.6 (range: 3–7). Immediately after intervention started (i.e., repeated readings) her CWPM score improved to 59, 25, 26, and 28 CWPM meeting her goal of 20 CWPM for the first three stories. After the third session her goal was switched to 25 CWPM. The week following I was not able to meet with MaKayla for intervention because the school was closed due to Snow Days. She met her goal on the following two stories but the third story took her two sessions (i.e., two days) to reach her goal. However, she read 35 and 41 CWPM, respectively during her treatment probes. Her mean score for the CR treatment probes was 52.0 CWPM (range: 25–77). The mean number of errors she made during the 1-minute treatment probes was 1.6 (range:0–5). MaKayla did not receive a 1-week maintenance probe because she was no longer at school. Her overall percentage growth rate was 67% (see Table 3.3)

**Listen to me.** MaKayla read a total of 24 of the 25 1st grade CR stories and 8 2nd grade CR stories over 39 sessions (13 weeks). The 25th passage was retained for the 1-week generalization probe. She was able to meet her CWPM goal on 24 of the stories during a single session; and 7 of the stories in two sessions. Five out of the seven times when two-sessions were required to meet her CWPM goal, she needed three trials during listen to me in order to reach her goal.
**CR Maze.** MaKayla’s data for maze responses on CR passages (Figure 3.4) show that when she read novel CR passages on the computer during baseline, her mean comprehension score on the maze passages was 1.6 (range: 0–3). Immediately after intervention started (i.e., repeated readings) her maze score improved to 7 correct responses, when her goal was 20 CWPM. Her mean maze score for the CR treatment probes was 8.6 correct responses (range: 5–15). Her overall percentage growth rate was 22%.

**AIMSweb CWPM.** MaKayla’s data for the CWPM on AIMSweb passages (Figure 3.3) show that when she read novel passages on the computer during baseline, her mean fluency score was 8.3 (range: 5–12). The mean number of errors she made during baseline was 4.6 (range: 4–5). MaKayla’s scores on her generalization probes remained stable across intervention. After 18 CR stories her scores on generalization probes began to noticeably improve reaching 32 CWPM. MaKayla’s highest score was 39 CWPM; her mean score was 22.6 CWPM (range: 15–39). MaKayla’s last generalization probe following intervention was 39 CWPM, which was her highest score. The mean number of errors she made during the 1-minute generalization probes after attaining the 25 CWPM goal was 7.4 (range: 6–10). Her overall percentage growth rate was 36%.

**AIMSweb maze.** MaKayla’s maze response data on AIMSweb passages (Figure 3.5) show that when she read novel AIMSweb passages during baseline, her mean comprehension score on the maze passages was 1.6 (range: 0–3). MaKayla’s scores on the maze comprehension questions were variable. At this point her mean maze
comprehension score was 4.6 correct responses (range: 2–10), with her best score being achieved the final AIMSweb probe before intervention was completed. This data indicates that MaKayla nearly tripled the number of correct responses she was able to make during the 3-minute comprehension maze on AIMSweb passages after intervention began. This reciprocally reflects that MaKayla’s overall fluency increased. That is, once she started reading more fluently on generalization passages on the 1-minute timings, she was also able to read more fluently on the mazes, increasing her opportunities to respond and subsequently her comprehension accuracy. Her overall percentage growth rate was 50% (Table 3.3).

**Independence.** During intervention MaKayla required an average of 5 behavior prompts and 7 task prompts (Figure 3.1). Makayla was a very low reader, which was a major effect of her behavior during intervention, which affected how any prompts she needed during an intervention session. The mean of behavior prompts needed was 16 (range: 0-4). The mean of task prompts needed was 2 (range:0-6). Overall she demonstrated that she was able to use the software independent of prompts from the experimenter. An incentive was introduced to MaKayla since she enjoyed Ninja Turtles and playing video games to assist with her motivation on the computer and reading during sessions. If she met her goal and tried her hardest during intervention she was allowed to play 3 minutes of a Ninja Turtle game or watch 3 minutes of the television show. This incentive was introduced to her the 13th session into intervention. Her
behavior began to improve by the 24th session, which correlated with the decrease in task prompts needed during intervention. MaKayla was in intervention for 11 weeks.

**Social validity.** MaKayla did not return to school after the final intervention session, so no social validity data were available.

**Treatment integrity.** On average, MaKayla followed the procedural checklist (i.e., the computer’s directions) 89.6% of the time (range: 66.7–100%). IOA agreement on treatment integrity occurred for 51.3% of sessions with a mean of 94.2% (range: 70–100). Her most common procedural error was the need to be prompted to move to the next component in intervention and raising her hand when the graphs were shown.

**Kareem**

**CR CWPM.** Kareem’s data for the CWPM on CR passages (Figure 3.3) shows that when he read novel CR passages on the computer during baseline, his mean fluency score was 21.6 (range: 13–32). His mean number of errors during baseline was 5.8 (range: 3–8). During the first story in intervention his goal was 35 CWPM. On the first story in intervention (i.e., repeated readings) Kareem read 59 CWPM so his goal was switched to 40 CWPM the next session. His scores during those initial intervention sessions improved to 59, 51, 54, and 50 CWPM. When his goal was raised to 60 CWPM, he needed two sessions (i.e., two days) to reach his new goal on 4 stories, but he responded by consistently reading above 60 CWPM during his treatment probes. His mean score for the CR treatment probes was 65.7 CWPM (range: 63–88); his best score
was 88, achieved 3 sessions before his very last intervention session. The mean number of errors he made during the 1-minute treatment probes was 0.85 (range: 0–2).

Kareem quickly reached his goal of 75 CWPM on the practiced passages, and there was an increasing trend of his skills being generalized to novel passages. When 2nd grade stories were introduced, his CWPM read during the treatment probe continued to increase but his scores on the last AIMSweb passages decreased.

During the 1-week maintenance probe, Kareem’s score on the CR cold-read was 45 CWPM (with 4 errors). This indicates a 48% growth (Table 3.3).

Listen to me. Kareem read a total of 24 of the 25 1st grade CR stories and 4 of the 2nd grade CR stories over 34 sessions (13 weeks). The 25th passage was retained for the 1-week generalization probe. He was able to meet his CWPM goal on 17 of the stories in one session and eight of the stories in two sessions. When his goal was increased to 60 CWPM, 65 CWPM, and 70 CWPM it took him two days to reach his goal on 8 out of 9 stories until the end of intervention. This could have been because of a few factors; he was not at school the last couple days before spring break, so he did not receive intervention for 1 week and two days and the stories he was reading during intervention switched to 2nd grade stories since he completed all of the first grade stories. Seven out of the eight times when there were two-sessions required to meet his CWPM goal he needed three trials during listen to me in order to reach his goal.

CR Maze. Kareem data for the maze responses on CR passages (Figure 3.4) show that when he read novel CR passages on the computer during baseline, his mean
comprehension score was 3.6 (range: 3–4). Immediately after intervention started (i.e., repeated readings) his maze score improved to 9 correct responses with a 35 CWPM goal. His mean maze score for the CR treatment probes was 11 CWPM (range: 5–15).

His maze score for the novel CR passage during the 1-week maintenance probe was 8. He had a 36% percentage growth on CR maze passages (Table 3.3).

**AIMSweb CWPM.** Kareem’s data for the CWPM on AIMSweb passages (Figure 3.3) show that when he read novel passages during baseline, his mean fluency score was 23 (range: 19–30). His mean number of errors during baseline was 5 (range: 4–6). Kareem’s scores on his generalization probes slowly increased throughout intervention. The last probe before maintenance decreased and he read 39 CWPM. Throughout intervention, his mean score was 35.5 CWPM (range: 16–50). The mean number of errors he made during the 1-minute generalization probes was 4.88 (range: 1–10). During the 1-week AIMSweb maintenance probes, Kareem scored 27 CWPM (3 errors) respectively. Figure 3.3 shows that as Kareem increased the number of CWPM on the practiced CR passages, he also increased the number of CWPM on the AIMSweb generalization passages during intervention. He did not maintain this increase after 1 week. Overall, he had a 64% percentage growth on AIMSweb passages (Table 3.3).

**AIMSweb maze.** Kareem’s maze response data on AIMSweb passages (Figure 3.4) show that when he read novel AIMSweb passages during baseline, his mean comprehension score was 4.7 (range: 4–6). Kareem’s scores on the maze comprehension questions increased by the fourth generalization probe during intervention, he had 12
correct responses (44 CWPM). After this point his mean maze comprehension score was 8.25 correct responses (range: 4–10), with his best score being achieved the session after his last intervention session and when he read 39 CWPM.

During the 1-week maintenance probes, Kareem scored 2 correct responses on the mazes, respectively. Which may have to do with him being pulled during field day (an event during school when students are involved in different sports like activities). He was already involved in Field Day and he was pulled to receive maintenance probes. He has scored higher then 2 during previous intervention sessions, which is why being excluded from Field Day may have been a discrepancy in his score. He had a 63% percentage growth for AIMSweb mazes (Table 3.3).

These data indicate that Kareem doubled the number of correct responses he was able to make during the 3-minute comprehension maze on AIMSweb passages after intervention began.

**Independence.** During intervention Kareem required an average of 1 behavior prompt and 1 task prompts (Figure 3.1). Kareem responded to the intervention very well and was really intrigued by Betty Buckeye. There were sessions when he would reply to Betty Buckeye by saying “Betty Buckeye are you sure” after Listen to Me directions. He followed the instructions from Reading R.A.C.E.S without much prompting from the experimenter. The only time he needed to be prompted was when he was reminded to raise his hand when a graph was shown and speak louder. Other then that he was able to complete the intervention independently. Kareem was in intervention for 11 weeks.
**Social validity.** Kareem’s favorite story was *Football in the Park*. This was the 1st story that he read during training before intervention. He reported that he liked this story because Jaden caught the football and ran fast to get home so his mama wouldn't be mad. His least favorite story was *Dancing Jaycee* because, “It was about cheerleading.” In general, Kareem reported positively about the software because “it was fun” and that “it had more details to the words and it was more fun and you get to click stuff.” Kareem reported that he did become better at reading new stories on the computer because “I was very into it.”

**Treatment integrity.** Kareem followed the procedural checklist (i.e., the computer’s directions) 98.9% of the time on average (range: 80–100%). IOA agreement on treatment integrity occurred for 50% of sessions with a mean of 100%. His most common procedural error was not clicking “ok” after instructions had been read or not speaking loud and clear.

**Kiara**

**CR CWPM.** Kiara’s data for the CWPM on CR passages (Figure 3.3) show that when she read novel CR passages on the computer with no practice during baseline, her mean fluency score was 20.6 (range: 12–25). The mean number of errors she made during baseline was 4 (range: 3–6). Immediately after intervention started her CWPM score improved to 59, 42, 44, and 53 CWPM, meeting her goal of 30 CWPM for the first four stories. Next her goal was switched to 40 instead of 35 because she consistently read over 30 CWPM. When her goal was raised to 60 CWPM, she needed two sessions to...
reach her new goal on the first story (*Artist Laquita*), and then three sessions on the next story, when her goal was raised to 70 CWPM (*Caring Friends*). On the third day of *Caring Friends*, her goal was sliced back to 65 CWPM; however, she responded by reading above 101 CWPM during his treatment probe. Her mean score for the CR treatment probes was 68.9 CWPM (range: 39–101). The mean number of errors she made during the 1-minute treatment probes was .6 (range: 0–2). During the 1-week maintenance probe, Kiara’s score on the CR cold-read was 43 CWPM (with 5 errors). She had a 60% percentage growth on CR passages (Table 3.3).

**Listen to me.** Kiara read a total of 24 of the 25 1st grade CR stories and 5 of the 2nd grade CR stories over 36 sessions (10 weeks). The 25th passage was retained for the 1-week generalization probe. She was able to meet her CWPM goal on twenty-two of the stories during a single session; 4 of the stories in two sessions; and two of the stories in three sessions. Out of the 4 stories that took two sessions to complete, she needed a variation of two and three trials during listen to me in order to reach her goal.

**CR Maze.** Kiara’s data for maze responses on CR passages (Figure 3.4) show that when she read novel CR passages on the computer with no practice during baseline, her mean comprehension score on the maze passages was 3.6 (range: 2–5). By the first intervention story her maze score improved to 10 correct responses when her goal was 30 CWPM. Her mean maze score for the CR treatment probes was 12.8 CWPM (range: 8–15). Her maze score for the novel passage during the 1-week maintenance probe was 4.
Over the course of the intervention she had a 31% percentage growth on CR maze passages (Table 3.3).

**AIMSweb CWPM.** Kiara’s data for the CWPM on AIMSweb passages (Figure 3.3) show that when she read novel passages on the computer during baseline, her mean fluency score was 25.3 (range: 18–31). The mean number of errors she made during baseline was 3.6 (range: 2–5). Kiara began generalizing the fluency skills she gained during the CR practiced passages to the AIMSweb passages by the third probe, where she read 57 CWPM. Her scores were variable. She regressed twice (scoring 29 and 41 CWPM) before progressing to 50 CWPM. She then began to regress again to 43 and 38 CWPM for the other generalization probes, but remained above baseline.

Throughout intervention, her mean score was 37.3 CWPM (range: 21–57). The mean number of errors she made during the 1-minute generalization probes was 4.1 (range:0–8). During the 1-week, Kiara scored 55 CWPM (3 errors). Similar to Kareem, Kiara’s AIMSweb generalization probes were variable but slowly increased during intervention. Her data also remained stable after 1 week. Overall, she had a 68% percentage growth on AIMSweb passages (Table 3.3).

**AIMSweb maze.** Kiara’s data for the maze responses on AIMSweb passages (Figure 3.4) show that when she read novel AIMSweb passages during baseline, her mean comprehension score on the maze passages was 7 (range: 5–9). Kiara’s scores on the maze comprehension questions increased to a new high score of 15 by the third generalization probe, where she had read 57 CWPM. Her mean maze comprehension
score during intervention was 11.4 correct responses (range: 6–15), with her best three scores consistently being achieved before the last generalization probe when she read between 40-53 CWPM. During the 1-week maintenance probes, Kiara scored 10 on the maze. This was a 64% percentage growth on AIMSweb mazes (Table 3.3).

These data indicate that although Kiara did not quite double the number of correct responses, her fluency was not affected and she repeatedly scored higher than her baseline score minus one maze during intervention. She slightly improved her maze comprehension scores.

**Independence.**

During intervention Kiara required an average of 1 behavior prompt and 1 task prompt (Figure 3.2). Majority of her prompts were behavior prompts, reminding her to stay on task or to not fidget in her hair during intervention. Kiara responded to the intervention very well as far as completing the steps. She stated in the Social Validity survey that she was bored. That may have a lot to do with her being able to remain on task. Kiara was in intervention for 10 weeks.

**Social validity.** Kiara’s favorite story was *Grandma’s pancakes*, “Because I have a grandma and it’s fun”. She read this story towards the end of intervention. When asked what her least favorite story was, Kiara replied, “Peanuts, because peanuts are nasty.” Kiara did not seem to feel too positive about the intervention. She enjoyed seeing the graphs on the computer because she thought it was fun and she felt as if she became better at reading the stories on the computer because she learned new words. She did not
want to continue reading on the computer because she stated that it was “boring” and she didn't think her classmates would like the program because of it being boring. She said “it would be more fun if it showed pictures.”

**Treatment integrity.** Kiara followed the procedural checklist (i.e., the computer’s directions) 89.4% of the time on average (range: 71.4–100%). IOA agreement on treatment integrity occurred for 55% of sessions with a mean of 93.7% (range: 80–100).

Kiara had a higher percentage of procedural errors, due to being easily distracted. The experimenter pulled her on her birthday and her reading score decreased tremendously. She read 4 CWMP, which was lower than baseline. It is believed that it being her birthday was a distraction and caused her to read at a lower rate.

**Layla**

**CR CWPM.** Layla’s data for the CWPM on CR passages (Figure 3.3) show that when Layla read novel CR passages on the computer with no practice during baseline, her mean fluency score was 25.3 (range: 17–37). The mean number of errors she made during baseline was 3.7 (range: 3–4). Immediately after intervention started her CWPM score improved to 51, 82, 66, and 58 CWPM, meeting her goal of 45 CWPM for the first four stories. Every time her goal was increased she met her goal. By the end of the intervention session her goal was 90 CWPM. The first story she read during intervention was the only time it took her two sessions to meet her goal. Her mean score for the CR treatment probes was 80.7 CWPM (range: 51–105), with her best score being achieved
29 sessions into the intervention. The mean number of errors she made during the 1-minute treatment probes was 1.2 (range: 0–4).

Layla quickly reached her goal of 90 CWPM on the practiced passages and these skills quickly generalized to the AIMSweb passages. During the 1-week maintenance probe, Layla’s score on the CR cold-read was 49 CWPM (with 5 errors). She had a 53% growth for CR passages compared to baseline (Table 3.3).

**Listen to me.** Layla practiced a total of 24 of the 25 1st grade CR stories and 5 2nd grade CR stories over 32 sessions (10 weeks). The 25th passage was retained for the 1-week generalization probe. She was able to meet her CWPM goal on 29 of the stories during a single session and one of the stories in two sessions. She always seemed to reach her goal. Layla needed on average 1 trial during listen to me in order to reach her goal.

**CR Maze.** Layla’s data for the maze responses on CR passages (Figure 3.4) show that when she read novel CR passages on the computer with no practice during baseline, her mean comprehension score on the maze passages was 3 (range: 2–4). Immediately after intervention started her maze score improved to 10 and 15 correct responses on the first two passages when her goal was 45 CWPM. Her mean maze score for the CR treatment probes was 14 (range: 12–20). She reached the ceiling on multiple CR mazes. Layla’s maze score during the 1-week maintenance probe was 13. She had a 21% growth for the CR mazes compared to baseline (Table 3.3).

**AIMSweb CWPM.** Layla’s data for the CWPM on AIMSweb passages (Figure 3.3) show that when she read novel passages on the computer during baseline, her mean
fluency score was 26 (range: 14–38). The mean number of errors she made during baseline was 5.3 (range: 3-7). On the first probe after practicing three CR stories, Layla read at 48 CWPM on the generalization probe. On the next probe, her CWPM increased to 49 CWPM. Her CWPM decreased on the next two probes to 30 and 36 CWPM. Throughout the rest of intervention she scored between 55-83 CWPM. Throughout intervention, her mean score was 56.9 CWPM (range: 30–71). Her mean number of errors during the 1-minute generalization probes was 3.0 (range: 1–6).

During the 1-week maintenance probes, Layla scored 62 CWPM (3 error, respectively. Figure 3.4 shows that Layla’s score with practice passages had a small increase but were variable. She increased the number of CWPM on the AIMSweb generalization passages during intervention. One week after intervention her data points decreased. Overall, she had a 46% percentage growth for AIMSweb passages (Table 3.3).

**AIMSweb maze.** Layla’s data for the maze responses on AIMSweb passages (Figure 3.4) show that when she read novel AIMSweb passages during baseline, her mean comprehension score on the maze passages was 7 (range: 5–10). Layla’s scores on the maze comprehension questions increased by the second and third generalization probe, where she had 13 and 15 correct responses (48 and 49 CWPM, respectively). Her mean maze comprehension score was 14.1 correct responses (range: 5–17), with her best score being achieved with the fifth generalization probe into intervention when she read 70 CWPM. During the 1-week maintenance probes, Layla scored 16 correct on the mazes. She had a 50% percentage growth on the AIMSweb mazes (Table 3.3).
These data indicate that Layla doubled the number of correct responses she was able to make in during the 3-minute comprehension maze on AIMSweb passages after intervention began, Layla’s overall fluency and comprehension increased.

**Independence.** During the first 16 intervention sessions Layla required an average of 1 behavior prompt and 1 task prompt (Figure 3.2). She became very independent when using the software. During the second half of intervention she averaged .3 task prompts. During the beginning of intervention if she was prompted it was to raise her hand or to speak louder. On average she finished the maze early 8 times and she was prompted to look over her answers. Layla did not take very long to complete intervention during a session. Layla was in intervention for 9 weeks.

**Social validity.** Layla’s favorite story was *Rosa Parks*. This was the fifth to last story that she read during intervention. She reported that she liked this story because “I watched a movie with Dr. Martin Luther King and it reminded me of Black people not being able to get on the bus and they were treated the wrong way.” She reported that she liked all the stories and she did not have a least favorite. In general, like most of the participants, Layla was positive about the software stating, “it was fun.” Layla also reported that she liked reading on the computer because of the mazes, and she could see how many words she read on the graph. She said she became better at reading stories on the computer by reading to the computer. Although she seemed to enjoy the intervention she stated that she would not like to continue reading on the computer because she would like to read less often and not everyday.
Treatment integrity. Layla followed the procedural checklist (i.e., the computer’s directions) 97.0% of the time on average (range: 71.4–100%). IOA agreement on treatment integrity occurred for 50% of sessions with a mean of 98.7% (range: 80–100). Most commonly, once she was familiar with the program, Layla skipped the computer’s directions only for multiple listen to me’s, read to me, and maze session
Table 3.1

*DIBELS Next Scores on Oral Reading Fluency for Middle of the Year, and End of the Year.*

<table>
<thead>
<tr>
<th>Name</th>
<th>MOY Raw</th>
<th>MOY Risk</th>
<th>MOY (Percentage Growth)</th>
<th>EOY Raw</th>
<th>EOY Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaKayla</td>
<td>7</td>
<td>Well Below</td>
<td>(N/A)</td>
<td>N/A</td>
<td>At-Risk</td>
</tr>
<tr>
<td>Kareem</td>
<td>13</td>
<td>Well Below</td>
<td>(54%)</td>
<td>26</td>
<td>Well Below</td>
</tr>
<tr>
<td>Kiara</td>
<td>18</td>
<td>Below</td>
<td>(46%)</td>
<td>42</td>
<td>Below</td>
</tr>
<tr>
<td>Layla</td>
<td>25</td>
<td>At or above</td>
<td>(37%)</td>
<td>58</td>
<td>At or above</td>
</tr>
</tbody>
</table>
Table 3.2

*Baseline and intervention scores by mean and range on AIMSweb passages for correct words per minute (CWPM), correct responses on maze passages, and percentage growth for both measures.*

<table>
<thead>
<tr>
<th>Name</th>
<th>Baseline CWPM</th>
<th>Intervention CWPM</th>
<th>Baseline Maze</th>
<th>Intervention Maze</th>
<th>Percentage growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>MaKayla</td>
<td>10-16</td>
<td>8</td>
<td>10-39</td>
<td>22</td>
<td>0-3</td>
</tr>
<tr>
<td>Kareem</td>
<td>19-30</td>
<td>23</td>
<td>16-50</td>
<td>35</td>
<td>4-6</td>
</tr>
<tr>
<td>Kiara</td>
<td>16-46</td>
<td>25</td>
<td>21-57</td>
<td>37</td>
<td>5-9</td>
</tr>
<tr>
<td>Layla</td>
<td>26–36</td>
<td>26</td>
<td>30-83</td>
<td>56</td>
<td>5-10</td>
</tr>
</tbody>
</table>
Table 3.3

Percentage growth for Culturally Relevant (CR) and AIMSweb correct words per minute (CWPM) and mazes for each participant, ranked in order of most improved.

<table>
<thead>
<tr>
<th>Participant</th>
<th>CR CWPM</th>
<th>CR Maze</th>
<th>AIMSweb CWPM</th>
<th>AIMSweb Maze</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaKayla</td>
<td>67%</td>
<td>22%</td>
<td>36%</td>
<td>50%</td>
</tr>
<tr>
<td>Kareem</td>
<td>71%</td>
<td>36%</td>
<td>64%</td>
<td>63%</td>
</tr>
<tr>
<td>Kiara</td>
<td>60%</td>
<td>31%</td>
<td>68%</td>
<td>64%</td>
</tr>
<tr>
<td>Layla</td>
<td>53%</td>
<td>21%</td>
<td>46%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Note: Percentage growth for CR passages compare baseline mean to the CR scores in intervention read.
Figure 3.1 MaKayla and Kareem’s Independence data

* T- Task prompt
Figure 3.2 Kiara and Layla’s Independence data

*T- Task prompt
Figure 3.3 MaKayla, Kareem, Kiara, and Layla’s CWPM on novel CR stories, novel AIMSweb stories, and practice CR passages
Figure 3.4 MaKayla, Kareem, Kiara, and Layla’s Participant’s correct responses on CR mazes and AIMSweb mazes
Chapter 4: Discussion

This chapter reviews the results of the study organized by each research question. Each question is answered from an examination of the data collected. Also included in this chapter is anecdotal information for each participant, limitations of the study, suggestions for future research, and implications for practice.

This study was the second experimental field test to examine the effects of a multi-component, supplemental intervention (i.e., RRI and CR material) engineered into a novel CAI software program. CR material was combined with RRI as a way to increase ORF skills faster on practiced passages and to help with transferring fluency skills to unpracticed, NCR passages for African-American first-graders who showed risk for reading failure.

If the reader is able to connect through text through familiar vocabulary and background knowledge this could help with improving reading skills for at-risk students (Bennett, 2014). CR reading material may also aid in motivating students (Bennett, 2014). Literature on repeated readings state that students should read passages 3-4 times to help with fluency. To enhance instructional time for RRI, incorporating CR material may help the reader reach their fluency goal quicker, since they are able to connect to the reading based on familiar background knowledge and vocabulary being used.

A non-concurrent multiple baseline probe across participants design was used to demonstrate experimental control. Pre-and post-test measures were also administered to participants. These measures consisted of WRMT–R subtests of word attack and word
identification (pre-tests), DIBELS oral reading fluency benchmark and phoneme segmentation assessment data was provided by the experimenter for MOY and EOY and.

**Research Questions**

1.) What effect will a repeated reading intervention (RRI) using culturally relevant (CR) passages delivered through computer software have on first-grade urban learners’ ability to read correct words per minute (CWPM)?

There was a functional relationship between the CAI program using CR passages paired with RRI and the fluency growth on practiced passages of all four participants. Figures 3.3 & 3.4 show that all participants responded quickly to the intervention and reached their fluency criterion when practicing CR passages. This shows that using explicit direct instruction to target oral reading skills of at-risk urban learners helped to increase their CWPM on practice passages. When participants’ goals were raised (i.e., from 35 CWPM to 40 CWPM from 40 to 45 CWPM) participants were still able to reach their criterion.

Large gains were seen with Layla whose reading goal started at 45 CWPM and ended at 90 CWPM. Given that her baseline data showed an increasing trend and that her pre-test performance was slightly higher than the inclusion criterion had been set, it may be that Layla was already on her way to becoming a proficient reader before starting intervention. This may provide evidence that the cut off score of 23 was appropriate; that is, students, like Layla, performing above 23 may not need the intensity of intervention this program provided. Makayla also responded to the intervention quickly. She had a
continual increasing trend of CWPM. When she began to read 2nd grade stories, she continued to reach her goal. At the beginning of intervention Layla was reading 36 CWPM, 59 CWPM, and 25 CWPM. Her last three stories of intervention were read at 72 CWPM, 73 CWPM, and 77 CWPM. Kareem made CWPM gains on practice passages as well. Whenever a criterion was set he reached his goal through the course of intervention.

There were times when some participants read a story more than once to reach their goal. There were seven stories that took MaKayla two sessions to meet her set criterion. There were eight stories that took Kareem two sessions to meet his set criterion. For Kiara, there were six stories that took her two sessions in order to meet her criterion and two stories that took her three sessions to meet her set criterion. For Layla, there was one story, the first story in intervention that she needed two sessions to surpass her criterion. None of the students needed more than three sessions to reach their goals and all of the students showed substantial gain in CWPM on practiced passages. These findings are consistent with other research using repeated reading interventions (Chard, Vaughn, & Tyler, 2002; Strickland et al., 2013).

Although there is no direct assessment of the effects of the CR passages on CWPM these stories may have contributed to the increased fluency of practice passages. This may give credence to the importance that instruction based on student’s background knowledge may help students to develop a consciousness in which they are able to analyze cultural norms and values by not solely attending to the society’s perception (Coffey, 2008).
Although, some of the participant’s scores decreased when 2nd grade stories were introduced, it was not a major drop considering the level of difficulty. Their scores still remained higher than baseline.

2.) What effect will a RRI with CR passages delivered through computer software have on the generalization of ORF to novel AIMSweb passages for first-grade urban learners?

By the end of intervention all four participants showed gains on their novel AIMSweb generalization passages. This shows that using repeated readings with consistently increasing goals potentially fosters transfer to other untrained passages. The CWPM were lower than practiced passages, but all participants made gains over baseline AIMSweb passages. When MaKayla read a novel AIMSweb passage for the first time, for example, she read 15 CWPM with 7 errors. The final AIMSweb probe that she was given before the end of intervention she read 39 CWPM with 6 errors. The errors were about the same but her fluency increased over half of what she was reading at the beginning of intervention. This participant was unique because at the beginning of the study she stated that “I can’t read” and there were multiple sessions where she would stop reading in the middle of intervention and one session she completely shut down and intervention ended early. Towards the end of her intervention sessions she wanted to continue reading the entire story even if the 1-minute timing ended, she stated that “I can read now” she also mention reading a book to her dad and not missing any words. With this participant not only did her confidence in reading boost, but by the end of the study, she actually wanted to read. That is tremendous growth not easily captured with the
Kareem showed gains when reading novel AIMSweb passages during intervention. When intervention began he was reading his first novel story at 16 CWPM with 7 errors. The final novel AIMSweb passage he read 39 CWPM with only 1 error. He basically doubled his reading performance over his initial efforts.

Kiara showed slight gains when reading AIMSweb generalization passages. When she first began intervention she read 22 CWPM with 8 errors. On her last AIMSweb probe she read 38 CWPM with 3 errors. She read 15 more word and cut her errors by half.

Layla showed gains when transferring ORF skills to novel AIMSweb passages. All of her novel AIMSweb passages except one was higher than previous CR cold reads. This shows that her skills were beginning to transfer. On her first probe during intervention she read 48 CWPM and had 2 errors. On her last reading probe she read 70 CWPM with 3 errors. Although her errors increased she read 22 more words than she read at the beginning of intervention.

As might be expected the students showed the greatest gains on the CR training passages because these passages were read repeatedly before recording the final read. It is noteworthy that the CWPM for AIMSweb (generalization) passages systematically co-varied or increased in the pattern as did the practice passages. This pattern strongly
supports the effect of the intervention on reading generalization. Particularly impressive in Layla’s AIMSweb data which often shows scores close or equivalent to those of the practice passages.

3.) What effect will a RRI with CR passages delivered through computer software have on the reading comprehension of practiced CR passages for first-grade urban learners?

CR stories as well as CR maze comprehension passages were delivered on the computer. Students were able to click on the correct word in the fill-in-bubble after reading and practicing the story. They were only able to take the maze if they reached their reading goal for the session. All participants except Layla showed improvement on their CR maze comprehensions passages when compared to baseline. Layla’s scores in baseline continued to increase and when intervention started her scores on maze comprehension scores continued to increase. A contribution to this could be that the participants were more comfortable with taking the maze. Initially, the participants were unfamiliar with how to work the maze, and needed a few training sessions to respond with ease. Further, their increased fluency probably contributed to the higher maze scores. Kiara’s maze scores showed an increasing trend until her 24th sessions where her maze scores began to plateau. Kareem’s scores increased as well but were pretty stable after his 16th session.

4.) What effect will a RRI with CR practiced passages delivered through computer software have on the reading comprehension of generalization passages (AIMSweb) for
Two participants (Kiara and Layla) experienced greater growth on their AIMSweb generalization passages when compared to baseline. Although this is true, this intervention determined that all four participants showed gains on AIMSweb mazes. This demonstrates that their increase in fluency aided in their improvement in comprehension.

This study supports what was said by (Nation & Angell, 2006); that reading comprehension and fluency go hand in hand. If a student is not able to read fluently or recognize written words this could have a negative affect on their reading. This study shows that students whose reading fluency increased demonstrated higher gains on maze comprehension passages when compared to baseline. Martin et al., (2014) also stated that fluency is the bridge to reading achievement and comprehension. Greater oral reading fluency skills allows a reader to improve comprehension skills.

5.) What effect will a RRI with CR passages delivered through computer software have on the maintenance of comprehension on generalization passages (AIMSweb) for first-grade urban learners after intervention?

For the 1-week AIMSweb maze passage, MaKayla was no longer in school, Kareem did not perform as well as he did during intervention. He scored an average of 8 correct responses on AIMSweb maze passages (range:4-12) during intervention and 2 correct responses on AIMSweb maze passages post intervention. This score is an outlier of his intervention performance. It may be that on the day of this assessment he was
pulled from a sport activity that had greater draw. The maintenance scores for the other two students were comparable to those of the intervention, suggesting good effects of the instruction.

6.) *What effect will a RRI using CR passages delivered through computer software have on the generalization of ORF skills on a cold read of CR passages for first-grade urban learners?*

This study showed that the CR cold reads for all the students varied somewhat but overall, showed a steady upward trend. Similar to the AIMSweb passages, these data paralleled the practice passages, again indicating a generalizing effect from the repeated reading intervention. Although for all the students there is some overlap with baseline scores and one very low score for MaKayla and Kiara are not easily explained the fluency steadily increased for these students is convincing, suggesting positive intervention effects. One possible explanation for Kiara is that this assessment was the day of her birthday and she needed prompts to pay attention during intervention.

Furthermore this was not only harder but seemed to be of little interest (*Cosi Space Museum*) because she kept looking away from the screen and tended to miss simple words (e.g., his, with, & went). They were clearly in her reading repertoire. Kiara, like her peers finished reading CR cold reads at a level considerably higher than baseline.

7.) *How many verbal prompts were necessary for the participants to use the computer software independently of researcher prompts according to the procedural integrity*
According to the procedural checklist by the end of intervention all participants (except Kiara) needed 0-1 tasks prompts to complete the intervention delivered on the computer software. At the beginning of intervention MaKayla’s task prompts throughout the first 19 sessions ranged between 1-8 prompts with an average of 3.6 tasks prompts a session. MaKayla was in Tier 1 and one of the lower readers compared to the other participants. She would constantly come to intervention pouting and stating that she did not want to read because she couldn’t read. She needed prompts to speak louder during intervention, to click on certain tasks the computer asked her to do, to raise her hand when a graph was shown, and to try her best. Whenever the participants met their goal during a session they received a sticker on their chart with stories listed. The stickers were used as a small incentive. This incentive was not motivating to MaKayla so the experimenter brainstormed with the research team on various reinforcements to implement.

Before beginning one of her sessions she said that she didn't want to be at school and she didn't want to attend the intervention sessions. During this session MaKayla completely stopped reading in the middle of the session and refused to continue. Before she stopped reading she was prompted to follow along because she looked away from the screen multiple times, she was slouching in her chair and rubbing her eyes consistently. She was asked if she would like a note to go home to her mother stating how well she has
been doing in intervention since her mother signed her up to help improve her reading skills. It was also explained to her the importance of learning to read. She stated that she did want a note sent home along with a picture of the Ninja Turtles on it because they were her favorite characters. By the 7th intervention after receiving the note she asked why did she have to take home another note, she told the experimenter that her mom was not reading them.

The experimenter noticed that MaKayla may have not attended to the intervention very well, but she constantly talked about playing video games and the Ninja Turtles. Her incentive was then switched to her having the choice of watching a Ninja Turtles show for 3 minutes or playing a Ninja Turtles game for three minutes, only if she tried her hardest and met her goal. Two sessions after the new reinforcer was implemented MaKayla’s attitude during intervention and reading began to change. She now required an average of 1 prompt per session with a range between 0-3. When she was prompted it was to raise her hand when a graph was shown. She stated that she felt silly raising her hand. During sessions she began to talk more, and she stated that she read a story to her dad without missing any words. Her teacher also reported that her confidence increased and that MaKayla said, “I can read now”! During intervention sessions she wanted to continue reading stories after a 1-minute timing before moving on. During the last sessions she stated that she liked the experimenter as her favorite teacher and she drew a picture for the experimenter and one of the 2nd observers.
Kareem responded quickly to the intervention delivered through the Reading R.A.C.E.S and began working independently of prompts from the experimenter. During his first 15 sessions he required an average of 1.4, which ranged between 0-4 tasks prompts. After those sessions he required an average of .3 prompts. Majority of his prompts were to click on “ok” after directions were read, or to speak louder during RA or LTM. Overall Kareem enjoyed the intervention and was fascinated by “Betty Buckeye” the computer voice that delivered instruction.

Kiara’s tasks prompts remained fairly stable. She needed the most task prompts (8) during the 1st session of intervention. These tasks prompts included clicking “ok” after instructions were stated, following along during intervention (she was easily distracted), clicking on the last word, reading during LTM and TR, and trying her best during intervention.

Kiara was really fidgety during intervention sessions. She would play in her hair, if there was an object on her clothing she would tinker with it. There were a couple times when she read with her hands in her mouth. She was also easily distracted. She needed frequent prompts to pay attention. In the room where intervention took place there was a window in front of them. If someone walked by she looked away from the computer screen. There was one session where she pulled out a tube of lipstick and began to play with it. There was also one session where she would switch the pitches in her voice from reading at a very low pitch to reading at a very high pitch.
During the first half of intervention sessions she needed an average of 1.3 tasks prompts to complete intervention, with a range between 0-8. During the second half of intervention sessions she needed an average of 1 prompt, with a range between 0-4. Task prompts that Kiara needed during the 2nd half on intervention included being reminded to read as soon as “Betty Buckeye” says go, finding her initials and name during the beginning of intervention, listening during RTM instead of reading along, and reading along with the computer during RA. During the last session she needed four prompts to complete the intervention session.

Layla’s task prompts were the highest between her 1st and 7th session, averaging 2.1 prompts ranging between 0-6. Sessions following she averaged .3 prompts out of 23 sessions, ranging between 0-1 tasks prompts. Task prompts for Layla included clicking “ok” after directions were presented from the Reading R.A.C.E.S, to read along during RA, and to raise her hand when a graph was shown. She became very independent when working with Reading R.A.C.E.S. There was an error correction screen that displayed after every one-minute timing that included words that were misread. By the 23rd session she was the only participant that was able to identify and click on words that she did not know.

Overall every participant (except Kiara) decreased the number of task prompts needed in order to complete the intervention session independently.

8.) How satisfied will participants be with the RRI delivered through computer software for increasing ORF in first-grade urban learners?
All participants except one stated that they enjoyed the program. All of the participants stated that they did think that they became better at reading stories on the computer. Kareem and Layla reported that they enjoyed reading on the computer because “it had more details to the words, it was fun, you could click on stuff, and because of the mazes.” All participants enjoyed seeing their scores on the graphs because it let them know how many words they read and how they did on a reading or maze. One participant in particular (Kiara) stated that she did not like reading on the computer and did not want to continue reading on the computer because it was boring. She stated that if there were pictures that it would be more “fun.” This could explain why she was so distracted during sessions. The other two participants thought that the intervention was fun and that their classmates would enjoy reading on the computer because you are able to “click on stuff.”

**Limitations**

**AIMSweb Inconsistencies**

Students read novel AIMSweb passages in order to measure their transfer of oral reading fluency skills (generalization). There were times when these stories may have been easier or harder then the CR passages. The variation in the level of difficulty of the AIMSweb passages may have been a contribution to the different scores students received during intervention. The 17 AIMSweb stories that were used had a Spache readability level (based on the Spache readability formula) between (1.5-2.4). Initially there were pre primer stories being used as well as first-grade stories.
This should be considered a limitation because the stories were put into a randomizer and students read them in that order. So for example they may have read a mixture of pre primer stories and 1st grade stories. There is a chance that the pre primer stories included words that were easier to decode and the 1st grade stories may have seemed more difficult based on the word selection in the story, causing variation in the data. More so, to have a better idea of how the participants respond to generalization probes, pre primer stories should have been introduced before 1st grade stories. In that case the story difficulty increases as their fluency increases during intervention. These were also 1st-grade students reading stories below their current grade level.

Although the stories were randomized, one participant had a steady increasing trend when reading generalization probes (MaKayla). Although, the other participants had a slight increase in trends, their data shows that the amount of CWPM would increase by a couple words and decrease by a couple words the following session when a generalization probe was given. Could this be because one story was easier and the next was harder?

In spite of these findings, results should be determined with caution and studies in the future should consider this limitation in order to have a better understanding of student gains during intervention.
**Contribution to Student’s Gains**

All participants in this study showed growth over baseline levels. They all grew in CWPM and comprehension for training and generalization passages. Also, three of four displayed increased or total independence in following through the Reading R.A.C.E.S.

The multi component nature of this intervention (i.e., culturally relevant stories, repeated readings, computer delivered instruction) does not provide for a component analysis to determine which component is most responsible for the observed gains. Repeated readings are an evidence-based intervention and it would be valuable to determine if CR passages or computer delivered instruction provide an added effect.

Student feedback is another potentially contributing factor.

These and other related questions might be addressed in future research. The principle question of this study is whether this intervention package shows potential for classroom/ supplementary instruction for students with risk.

**Missed Days During Intervention**

Constraints of the school calendar including spring break, snow days, school activities, and students missing school could be described as a limitation to the findings of this study. Although all participants made gains their gains could possibly have been greater if they had not missed so much intervention. This problem was exacerbated with the difficulty of getting parent permissions causing the study to start late in the school year during the month of February.
For example, two weeks after intervention started there were several snow days followed two weeks later with spring break. Fortunately no reading losses were noted resulting from spring break.

MaKayla missed three days of school during intervention and she was not at school when maintenance probes were given. She was responding very well to the intervention but since she was pulled out of school early that could have a major affect on her fluency goals, especially since she was the lowest reader. Kiara missed four days of school and Kareem missed five days of school. Since there were multiple days that students missed intervention for various reasons, this could have an affect on how they responded to intervention. If the participants did not miss intervention due to spring break with they have increased their fluency goals? Would they have done better with generalizing skills on novel passages? Would their comprehensions scores have been affected?

**Interobserver Agreement for Task Prompts**

IOA data were not recorded for task prompts during intervention. Collecting IOA on task prompts would have strengthened findings. The average task prompts participants needed was evident, but IOA agreement would have improved the credibility of data. Recording the types of prompts provided to students might also be beneficial, for training and data collection purposes. Classifying prompts in this way would help the primary experimenter and second observer come to agreement on what is considered a task prompt.
Computer Treatment Integrity

There was a low percentage of treatment integrity for catching errors for the Reading R.A.C.E.S and also IOA on the computer software between the primary experimenter and 2nd observer. The computer treatment integrity sheet included two questions pertaining to the computer, “Did the computer fail to notice a mispronunciation? What word?” and “Did the computer prompt the student to click after 3 seconds of silence from the student?” Given that there were only two questions, the treatment integrity was 100%, 50%, or 0%.

The Reading R.A.C.E.S.’s error correction was only able to notice a mispronunciation if the participant clicked on the unknown word. If the participant mispronounced the word but did not click on it or skipped the word the computer was not able to recognize the error. Although the computer was not capable of recognizing such errors, there was an error correction screen where the primary experimenter was able to click on mispronunciations or skipped words. The computer then proceeded to the next step of allowing the participant an opportunity to practice the word.

The IOA for Reading R.A.C.E.S appeared to be below 90% as well. This is because there were times where either a 2nd observer or primary experimenter answered one of the treatment integrity questions by stating “N/A” and the other person recorded the opposite. Another reason IOA was low was sometimes observers sat at an awkward angle and were, therefore, not able to see if the computer recognized reading errors.
Future Research

AIMSweb

**Story selection.** As previously mentioned, one of the limitations to this study was the majority of AIMSweb passages not being given to the participants in order by difficulty level (from easiest to hardest). The readability scores were between their grade level and next grade level (2nd), since the pre primer stories were shorter and the 1st grade stories were longer this could have affected their reading scores. Researchers could order the stories in this perspective order to see if there is a different affect on generalization results.

**Student Gains**

**Contributions.** In order to determine if certain contributions had more of an effect on the student’s gains or independence, there could be parallel studies used between certain strategies. For example, compare a study with CR stories and repeated readings or Non-CR stories and repeated readings amongst the same group of students or comparison peers to see if one or the other have a greater effect on ORF skills. The two strategies could be separated, so one study involves repeated readings and the other involves CR stories with another fluency strategy.

To determine whether one-on-one attention was a reinforcement for student’s independence data, there could possibly be a study done with the researcher is close by but not in the view of the participant and a study where the research is within close
proximity of the participant where the participant can see he/she and determine which had the greatest effect on independence data.

**Implications for Practice**

Teachers should teach fluency skills, beginning at early grades (primary kindergarten 1st). Students should be explicitly trained by teachers to enhance their fluency skills by using the RRI strategy. CAI seemed to be a major factor with the participants because they overall enjoyed working on the computer. Implementing technology, especially with children growing up today with technology. There are statewide assessments that now have to be completed on the computer. Practicing reading on the computer could help students generalize their reading and computer skills (being aware of how to use a computer).

CR stories may aid with connecting background knowledge, vocabulary, and feeling a sense of connectedness to a reading passage. If students are familiar with the vocabulary and connect reading passages this could aid with fluency, which could better comprehension. When selecting CR passages it is important to make sure the stories are relevant to the students whom will be reading them. Hence the social validity assessment asked students which stories were their least favorite/ favorite and why. This could help motivate students when reading and actually keep them interested.

Once the software is completed it would be very useful for teachers to use in the classroom and possibly parents as well. Instead of students only being able to practice at school parents could use this intervention at home or anywhere where there is access to
the Internet. The more practice a student receives the better they become at reading. Since stories can be input by the experimenter, stories that interest the student can be chosen (i.e., sports, famous singers, animals) this could intrigue a student’s interest as well since it is a topic of their choice that they are reading about.

Although this study was done with first graders, it could be helpful for students who have reading disabilities and are reading below grade level. Overall, some students may just need explicit and repeated instruction to improve their reading skills.
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DIBLES (2013). University of Oregon Center on Teaching and Learning. Eugene, OR. Available at https://dibels.uoregon.edu/training/measures/benchmark.php


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Swanson, E., Vaughn, S., Wanzek, J., Petscher, Y., Heckert, J., Cavanaugh, C., & ...


Appendix A.

List of Culturally Relevant (CR) stories in alphabetical order with Spache readability:

Note (E) = expository.

<table>
<thead>
<tr>
<th>CR Story Name</th>
<th>Spache Readability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archie (E)</td>
<td>2.1</td>
</tr>
<tr>
<td>Artist Laquita</td>
<td>2.3</td>
</tr>
<tr>
<td>Ben Carson (E)</td>
<td>2.0</td>
</tr>
<tr>
<td>Caring Friend</td>
<td>2.1</td>
</tr>
<tr>
<td>Charles Turner (E)</td>
<td>2.0</td>
</tr>
<tr>
<td>Dad’s Hoppin’ John</td>
<td>2.1</td>
</tr>
<tr>
<td>Dancing Jaycee</td>
<td>2.3</td>
</tr>
<tr>
<td>Every Day Counts</td>
<td>2.3</td>
</tr>
<tr>
<td>Football in the Park</td>
<td>2.2</td>
</tr>
<tr>
<td>George Washington Carver (E)</td>
<td>2.1</td>
</tr>
<tr>
<td>Grandma’s House</td>
<td>2.0</td>
</tr>
<tr>
<td>Grandma’s Pancakes</td>
<td>2.3</td>
</tr>
<tr>
<td>Grandma’s Visit</td>
<td>2.0</td>
</tr>
<tr>
<td>Grandpa’s Sweet Potato Pie</td>
<td>2.0</td>
</tr>
<tr>
<td>Hide-and-go-Seek</td>
<td>2.1</td>
</tr>
<tr>
<td>Hopscotch Game</td>
<td>2.3</td>
</tr>
<tr>
<td>Jolita’s Birthday</td>
<td>2.0</td>
</tr>
<tr>
<td>Mama Works</td>
<td>2.0</td>
</tr>
<tr>
<td>Marcus Runs</td>
<td>2.1</td>
</tr>
<tr>
<td>Title</td>
<td>Grade</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>My Sister</td>
<td>2.3</td>
</tr>
<tr>
<td>New Student</td>
<td>2.3</td>
</tr>
<tr>
<td>Party for Sister</td>
<td>2.0</td>
</tr>
<tr>
<td>Peanut (E)</td>
<td>2.0</td>
</tr>
<tr>
<td>Sam the Superhero</td>
<td>2.2</td>
</tr>
<tr>
<td>Snow Angels</td>
<td>2.1</td>
</tr>
<tr>
<td>Sweet Potato (E)</td>
<td>2.0</td>
</tr>
<tr>
<td>Top Readers</td>
<td>2.3</td>
</tr>
<tr>
<td>*How to Grow a Garden</td>
<td>2.4</td>
</tr>
<tr>
<td>*Skating Party</td>
<td>2.5</td>
</tr>
<tr>
<td>*Rosa Parks (E)</td>
<td>2.6</td>
</tr>
<tr>
<td>*COSI Space Museum</td>
<td>2.6</td>
</tr>
<tr>
<td>*Water Park Part. 1 (Waiting for Uncle)</td>
<td>2.4</td>
</tr>
<tr>
<td>*Arthur Ashe (E)</td>
<td>2.6</td>
</tr>
<tr>
<td>*Water Park Part 2 (The Bus)</td>
<td>2.7</td>
</tr>
</tbody>
</table>

* Represents the 2nd grade stories
Appendix B.

Culturally Relevant Maze Passages

Arthur Ashe was a thin kid that grew up to be one of the best tennis players in the world. As a small child he liked (if to wonder) read books and listen to music (without only with) his mother. He also spent lots (of for my) time practicing. He became so good (of course that win) he played at school and later (coming she he) played on the United States (flag team history). He was the best player in the (country pool point).

Arthur played tennis all over the (break world neighborhood) and he was the first black (woman man maybe) to play in some of the (songs games number). One time, one country would not (show visit let) him play because of the color of (his their dry) skin. He did not think this (down should was) fair and he worked to make (mind prizes changes) so all people could play. He (didn't did spring) make things better.

Mr. Ashe was a (hardly happen very) smart man. That is why he was (park not so) good at tennis. He knew how (to back with) play smarter than many other men. (They He London) was also a very kind and (nice mean fee) man. Mr. Ashe always wanted to (he find) a good person. When he was (young hungry plant), his dad kept telling him that he (should going sunny) always do the right thing, and (that for clever) is what he did. He always (worked sang floor) hard to do his best and to (do drop room) what was right.

After he finished (playing early set) tennis, Arthur still helped people. Later (in letter) his life he became sick but he (still mess white) worked to help others. People still (remember requested money) what a wonderful man he was. (There Then Must) is even a tennis court in New York (that about food) is named after him.
Appendix C.

List of AIMSweb Stories in alphabetical order with Spache readability and labels 1-25

<table>
<thead>
<tr>
<th>AIMSweb Story Name</th>
<th>Grade Level set</th>
<th>Spache Readability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Boy Named Tom</td>
<td>1st</td>
<td>2.1</td>
</tr>
<tr>
<td>Cat loved Bird</td>
<td>1st</td>
<td>2.4</td>
</tr>
<tr>
<td>Goodbye Mom</td>
<td>1st</td>
<td>2.2</td>
</tr>
<tr>
<td>It was Mr. Bees</td>
<td>1st</td>
<td>1.7</td>
</tr>
<tr>
<td>Jeff was Happy</td>
<td>1st</td>
<td>2.0</td>
</tr>
<tr>
<td>John was Walking</td>
<td>1st</td>
<td>2.0</td>
</tr>
<tr>
<td>Mom and Dad</td>
<td>1st</td>
<td>2.3</td>
</tr>
<tr>
<td>Sam was Happy</td>
<td>1st</td>
<td>2.1</td>
</tr>
<tr>
<td>The Bird Feeder</td>
<td>1st</td>
<td>2.2</td>
</tr>
<tr>
<td>One Day Bob</td>
<td>PP</td>
<td>1.5</td>
</tr>
<tr>
<td>Billy has a</td>
<td>PP</td>
<td>2.1</td>
</tr>
<tr>
<td>Chris Was Not</td>
<td>PP</td>
<td>2.3</td>
</tr>
<tr>
<td>Fred is Slow</td>
<td>PP</td>
<td>1.7</td>
</tr>
<tr>
<td>Grace and Beth</td>
<td>PP</td>
<td>2.2</td>
</tr>
<tr>
<td>Hope was the</td>
<td>PP</td>
<td>2.3</td>
</tr>
<tr>
<td>Josh and Chris</td>
<td>PP</td>
<td>2.1</td>
</tr>
<tr>
<td>Molly Lives On</td>
<td>PP</td>
<td>2.0</td>
</tr>
</tbody>
</table>
## Appendix D.

### Treatment integrity Scripts

<table>
<thead>
<tr>
<th>Intervention Phase</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusting headphones, microphone, and screen</td>
<td>“Put these headphones on so they are over your ears and snug on your head. Do you need my help? How do they feel? Now we need to make sure the microphone is in front of your mouth like this (Adjust microphone). Can you see? You can tilt the screen if you need to.”</td>
</tr>
<tr>
<td>Explanation of setting of the ORF goal</td>
<td>Show student baseline data. “You read _____ CWPM on the first story you read on the computer; You read _____ CWPM on the second story you read on the computer; You read _____ CWPM on the third story you read on the computer. Your goal for now is _____ WPM (based on a sliding scale of their baseline starting place). Please click on _____ WPM.”</td>
</tr>
<tr>
<td>Present Story</td>
<td>“Today you are reading _____ (title of story). Find and select _____ (title of story) in the dropdown menu here.”</td>
</tr>
<tr>
<td>Prompts to stay on Task</td>
<td>If a participant needs to be redirected to an ongoing activity (e.g., Maze) restate the direction by asking “What did the computer tell you to do” and/or say “Keep going”, “Make sure you try your best”, or utilize the Betty Buckeye graphic organizer to prompt to stay on task.</td>
</tr>
</tbody>
</table>
Appendix E.

Post Intervention Questionnaire – Participants

1) Did you like reading on the computer?
   a. Yes
   b. No
   Why?

2) Do you think you became better at reading new stories on the computer?
   a. Yes
   b. No
   Why?

3) Did you like seeing your data on a graph?
   a. Yes
   b. No
   Why?

4) Would you like to continue to read on the computer?
   a. Yes
   b. No
   Why?

5) Do you think the other kids in your class would like this program?
   a. Yes
   b. No
   Why?

6) What was your favorite story? Why was it your favorite?
   Name of story:
   Reason:

7) What was your least favorite story? Why did you dislike this story?
   Name of story:
   Reason:
Appendix F.

**ORF Rules**

1. Use headsets at all times

2. Read with a strong, clear voice

3. Tap appropriate computer buttons

4. Look at computer screen at all times

5. Follow Betty Buckeye’s directions
Appendix G.

Participant sheet to show baseline data and goal before intervention
Appendix H.

Errors recorded using paper/data sheet

<table>
<thead>
<tr>
<th>Student</th>
<th>Goal: 40/60 (circle one)</th>
<th>Experimenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Observer</td>
<td>Computer</td>
<td>Date</td>
</tr>
<tr>
<td>LTM 1: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>LTM 2: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>LTM 3: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>Timed Reading: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>Maze: Correct</td>
<td>Incorrect</td>
<td></td>
</tr>
</tbody>
</table>

Ben Carson

Ray loves school. He wants to be a doctor some day, just like Ben Carson. Ben is black like Ray. Ben Carson is a doctor for children. He helps over 300 children every year. One time Ben was the only doctor who could help some very sick children. A doctor helped Ray’s little sister feel better when she was sick. Ray wants to be a doctor so he can help children feel better. Doctors also help children stay healthy so they don't get sick. Doctors must work hard in school for many years. Anyone can be a doctor if they work hard in school and get good grades. Ray really wants to be a doctor. He plans to work hard.
Appendix 1.

An example of the program, Story

Arthur Ashe was a thin kid that grew up to be one of the best tennis players in the world. As a small child he liked to read books and listen to music with his mother. He also spent lots of time practicing. He became so good that he played at school and later he played on the United States team. He was the best player in the country.

Arthur played tennis all over the world and he was the first black man to play in some of the games. One time, one country would not let him play because of the color of his skin. He did not think this was fair and he worked to make changes so all people could play. He did make things better.

Mr. Ashe was a very smart man. That is why he was so good at tennis. He knew how to play smarter than many other men. He was also a very kind and nice man. Mr. Ashe always wanted to be a good person. When he was young, his dad kept telling him that he should always do the right thing, and that is what he did. He always worked hard to do his best and to do what was right.

After he finished playing tennis, Arthur still helped people. Later in his life he became sick but he still worked to help others. People still remember what a wonderful man he was. There is even a tennis court in New York that is named
Appendix J.

Screenshot of the Maze Graph
Appendix K.

Calculation of IOA during listen to me and timed reading phases of intervention to check the computer’s accuracy on CWPM

<table>
<thead>
<tr>
<th>Student</th>
<th>Goal: 40/60 (circle one)</th>
<th>Experimenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Observer</td>
<td>Computer</td>
<td>Date</td>
</tr>
<tr>
<td>LTM 1: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>LTM 2: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>LTM 3: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>Timed Reading: Computer TWR</td>
<td>Actual TWR</td>
<td>Errors</td>
</tr>
<tr>
<td>Maze: Correct</td>
<td>Incorrect</td>
<td></td>
</tr>
</tbody>
</table>

Caring Friend

The teacher told the class, “Be nice to others, recess is a time to have fun!” CJ thought about how he got in a fight with his friend Marcus yesterday. CJ beat Marcus in a handstand contest. CJ laughed at Marcus, “Ha, ha. I won.” Marcus got mad and hit CJ. CJ hit Marcus back. The teacher didn’t see the boys, but their friend, Amar, saw them. He wanted the boys to be friends and not get in trouble. Amar told CJ, “You shouldn’t hit back, you should tell him you are sorry.” CJ was sorry. He didn’t like to fight. He wanted to be a caring friend. CJ decided he would not laugh or hit his friends.
## Appendix L.

Primary Researcher Treatment Integrity

### Primary Researcher PI Checklist

<table>
<thead>
<tr>
<th>Student:</th>
<th>Date:</th>
<th>Experimenter:</th>
<th>Observer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story Title:</td>
<td></td>
<td>Computer:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used script to ask student to put on headphones; adjusted microphone so that it is in front of student’s mouth; ask participant to adjust the computer screen for best view and tell goal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clicked on incorrect words for the probe and clicked save</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided all unknown words (after a 3 sec pause or when a student asked for help on the probe) if necessary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clicked on incorrect words for Listen to Me and clicked save</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clicked on incorrect words for Timed Reading and clicked save</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marked on passage when time ended on <strong>Listen to me</strong> and/or <strong>Timed reading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed student to take the maze (for AIMSweb only) and Recorded the Maze scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not allow student to take maze if goal score was not reached</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gave student neutral feedback and utilized the behavior management system when finished</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recorded the number of prompts the student required</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix M.

Primary Researcher Treatment Integrity for generalization probes

Primary Researcher PI Checklist

Student: ___________ Date: ________ Experimenter: _______ Observer: _______

Treatment/Generalization probe (circle one). Story Title: __________________________

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used script to ask student to put on headphones; adjusted microphone so that it</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>is in front of student’s mouth; ask participant to adjust the computer screen for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>best view and tell goal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clicked on incorrect words for the probe and clicked save</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided all unknown words (after a 3 sec pause or when a student asked for help on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the probe) if necessary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marked on passage when time ended</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed student to take the maze (for AIMSweb only) and Recorded the Maze scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not allow student to take maze if goal score was not reached</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gave student neutral feedback and utilized the behavior management system when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>finished.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recorded the number of prompts the student required.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix N.

Participant and Computer Checklist
Student: __________ Date: _______ Experimenter: _______ Observer: _______

Story Title: ________________ Time Start: _______ Time End: _______

Participant PI Checklist

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Comments/tally of prompts/type of prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clicked “yes/no” after directions were read.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read with their best effort during Cold Read</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed all given pre-teaching words</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed along/attended during read to me</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the story loud and clear during read along</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read with their best effort during listen to me and completed 3 one-minute timings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read with their best effort during treatment probe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raise Hand when graph shown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read all questions and answers before clicking answer during MAZE comprehension passage</td>
<td></td>
<td></td>
<td>Aloud or Silent</td>
</tr>
<tr>
<td>Asked for help when needed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of times the student required a prompt (in tally)</td>
<td></td>
<td></td>
<td>Behavior Prompts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Task Prompts</td>
</tr>
</tbody>
</table>

Computer PI Checklist- During intervention

<table>
<thead>
<tr>
<th>ORF-RR Actions</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the computer fail to notice a mispronunciation?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What word?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the computer prompt the student to click after 3 seconds of silence from student?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Observations:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>