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Combining explicit fluency instruction with GarageBand digital recording of repeated readings

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Combining Explicit Fluency Instruction with GarageBand

Digital Recording of Repeated Readings

By

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Abstract

This action research examines the effect of combining explicit fluency instruction with GarageBand digital recording of repeated readings. Three intermediate-aged students met individually with an instructor for twelve one-hour sessions where they received tutoring on the characteristics of good fluency. In addition, students used the GarageBand program to make digital audio recordings of their repeated readings. The findings showed gains in accuracy and reading rate for all three students and slight gains in comprehension for two of the students.

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Emily, for their constant love and support. From them I have learned to dream big

and to never give up. I dearly love you all.

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CHAPTER ONE

This thesis is a report of an action research study done to explore the

effectiveness of an after school tutoring intervention that combined intensive fluency

instruction with computer audio recording of repeated readings. First the chapter begins

with an explanation of my reasons for studying reading fluency. Next is a description of the

background and need for a system of fluency instruction that combines explicit teaching

with regular practice of newly learned fluency skills. The chapter continues with a

discussion of the need to utilize computer technology in reading instruction particularly

making use of such computer applications as GarageBand audio recording. Next the

research question is presented followed by a brief description of the research design.

Finally, limitations for the study are given followed by the chapter conclusion. A list of key

terms is presented at the very end of the chapter.

Motivations For Studying Reading Fluency

I understand first hand the humiliation and despair that goes with not being able to

read. My first motivations to be a teacher came from trying to help two of my siblings who

struggled in school and had developed a dislike for any school work that involved reading.

Despite my best efforts to help them from home and with little help from school, both

siblings' reading difficulties continued to be a problem that has impacted both their self-

esteem and career opportunities. I have been determined to find out how it was

possible that I mastered reading and became an avid reader, and my siblings who came

from the same loving home, attended the same school, and had the same teachers could

not master reading. Their difficulties have greatly inspired me as an educator to study how

reading is acquired and to develop research based methodology to help the many people

with reading challenges I encounter in my work as an educator.

Background and Need

In my work, I am frequently called upon to work with students in the intermediate grades that

are struggling with reading fluency issues such as difficulty with word recognition, slow reading

rate, and inability to read with expression. Many of these students need reading practice, but fail

to do so because they have developed a dislike for what has become a challenge for them. As the

years go by, the consequences of being a non-fluent reader grow exponentially as reading in the

content areas becomes increasingly complex.   A 1995 National Assessment of Educational

Progress (NAEP) report on oral reading found that 44% of fourth graders in the sample scored at

the lowest fluency ratings and read grade level text at word per minute rates of 89 or below

(Pinnell et al., 1995).   Research has identified a relationship between low fluency ratings and

lower scores on general measures of reading achievement (Pinnell et al, 1995). To further

highlight the problem, 2009 NAEP assessment results show that 67% of fourth graders are

functioning below proficiency levels in reading. 83% of these children are from low-income

homes and 85% of these children attend school in a high poverty area (NAEP, 2009). These

statistics suggest that there may be millions of low-income children that are currently at risk of

dropping out or failing to graduate from high school on time because their learning has been

greatly impaired by poor reading (Annie E. Casey Foundation, 2010).

More positively, helping students to improve their oral reading fluency has been found to improve overall reading proficiency and lead to gains in comprehension (Baker et al., 2008).   In the report of the National Reading Panel, fluency was listed as one of five critical components of reading alongside phonemic awareness, phonics, vocabulary, and comprehension (National Reading Panel, 2000). As an important component of reading instruction, it is important to clarify what reading fluency is. Fluency is an attribute of oral reading characterized by a reader's ability to read with correct phrasing, adhere to the author's syntax, and read with appropriate expressiveness (NAEP, 2002).   Good readers who have mastery of fluency are able to consistently and evenly integrate such skills as pausing in response to punctuation, phrasing text into meaningful breaks, using intonation, and instinctively putting stress on words within a sentence. Once students are able to integrate such skills, they are better able to think about the meaning of text (Pinnell & Fountas, 2009).

It is essential that teachers regularly assess the fluency development of their students and provide a balanced reading program that promotes fluency growth. Fluency progressively develops from mastering letter/sound relationships and phonics knowledge to word learning skills (Speece & Ritchey, 2005; Eldredge, 2005).   In order to be fluent, students must be able to break through the surface structure of text. That is, students must be able to decode words, understand the meaning of words, read words automatically, and read with appropriate expression. As students practice reading they learn how prosody or expressiveness in oral reading affects meaning (Rasinski, 2009). Since the ultimate purpose of reading is to comprehend the printed word, teachers need to focus on

instruction that leads to rich, in depth development of word knowledge and helps students

to think critically about what they are reading (Tannenbaum, Torgesen, & Wagner, 2006;

Applegate, Appelgate, & Modla, 2009).

   In addition to understanding fluency skill development, teachers need to know about

effective methodology for supporting fluency growth.   Methods such as repeated reading,

echo reading, phrase drill error correction, and listening passage preview have all been

found to support fluency growth (Rasinski, 1990; Homan, Klesius, & Hite, 1993; Martens et

al., 2006). Comprehensive approaches that combine multiple strategies like repeated

reading, sound/word boxes, and phrase drill correction have effectively promoted fluency

growth with struggling students (Rasinski, 1990; Devault & Joseph, 2004; Martens et al,

2006).   The primary goals in fluency instruction should be to allow students to hear fluent

reading regularly and to provide additional practice with appropriate leveled materials

that are interesting to them (Johns & Berglund, 2010).

Incorporating Computer Technology Into Reading Instruction

  Including enough practice opportunities in the busy school day can be a challenge. With

the prevalence of computer technology in schools today, it makes sense to utilize computer

technology to help students to practice oral reading. One way to accomplish this is to use

an Apple software application, called GarageBand, which allows users to record podcasts

and music. Using this application, it is possible for students to easily make and store digital

recordings of repeated readings independently of the teacher. Teachers and students can

listen to and discuss ways to improve future repeated reading recordings. While specific

studies using this application of computer audio recording to support fluency development are unknown to this researcher, there have been recent studies done that show positive gains in reading achievement with the use of computer assisted instruction with elementary and middle school struggling readers (Knezek & Christensen, 2007; Macaruso & Rodman, 2009; Lewandowski, Begeny, & Rogers, 2006). One study on the utilization of computer technology found that gains in reading achievement were greatest when teachers received adequate training and support on how to implement the computer technology into their existing curriculum (Savage et al., 2010). In the next section, I will present my research question and briefly explain my study design.

My Research Question and Study Design

My work as a substitute teacher and tutor has allowed me to be in many elementary and middle school classrooms. I have observed that one of the greatest needs in providing adequate fluency instruction and practice is time in the busy school day. As efficient time managers for our students it is wise to explore the options provided by computer technology. Many students that struggle with fluency issues in the intermediate grades do not have the motivation or interest to practice their oral reading enough to make the necessary gains. Such students also need more explicit fluency instruction and time to practice.

The goal of my study was to develop a one-hour after school intervention for students who struggle with fluency issues. Struggling students benefit from one to one support and supervision of oral reading practice to help them achieve the necessary fluency levels needed to function successfully at their grade level (Conderman & Strobel, 2008; Vadasy, Sanders, &

Peyton, 2005).   My goal was to find out if one-hour tutoring sessions that combined intensive

fluency instruction with GarageBand audio recording of repeated readings would be an effective

intervention for intermediate-aged struggling readers. Developing such an intervention will

enable me to offer a research-based after school tutoring option for the students in my area. This

tutoring option is in line with Wisconsin Core Standards (2010) for fluency development:

> Students should read with sufficient accuracy and fluency to support comprehension,
>
> read on-level text with purpose and understanding, read on-level prose and poetry
>
> orally with accuracy, appropriate rate, and expression on successive readings, and use
>
> context to confirm or self-correct word recognition and understanding, rereading as
>
> necessary (p. 17).

Using a collection of fluency developing materials, a Mac computer with GarageBand

application, and a USB snowball microphone, I set up a study that sought to answer the

following question:

> How does combining intensive fluency instruction with computer digital recording of
>
> repeated readings improve the fluency and comprehension growth of three
>
> intermediate aged struggling readers?

 The study was designed to be an after school tutoring opportunity for students

struggling with reading fluency. Three male students, one third grader and two fourth

graders, were referred to me through reading specialists at the schools I sub for. The

students met with me individually during the months of April, May, and June 2011 at my

learning center/office. After the pre test was administered, each student met with me for a

total of twelve one-hour sessions. Each session included a 30-minute fluency lesson

addressing such skills as paying attention to punctuation, chunking word phrases, reading

dialogue, and reading with emotion. Following the lesson, each student using the USB

snowball microphone and the GarageBand application on a Mac computer, audio recorded

himself while practicing repeated readings. After audio recording the repeated readings,

the student and I filled out monitoring and feedback sheets, discussed how the reading

sounded, and planned how to improve readings for the next time. Following each session I

listened to the student's reading to evaluate and plan the next fluency lesson. After the

twelve lessons were completed, the study concluded with post testing. In the next section,

there is a discussion of the limitations of this study.

Limitations

This study was an exploration of best practices to build fluency in intermediate-aged

students by combining explicit fluency instruction with GarageBand audio recording of

repeated readings. The study was limited to just three students. In addition, the study took

place after school at the end of the 2010 -2011-school year and unfortunately was

interrupted by end of the year activities, Memorial Day weekend, and the beginning of

summer break. We did persist and completed the necessary number of sessions, but lost

some of the continuity that would have been present if we could have done all the sessions

in a closer span of time. The next section will continue with a conclusion to this chapter.

Conclusion

My inspiration to become a teacher came from watching my family members as they

struggled through life with unresolved reading problems. In my work as a reading teacher,

I find many students develop a dislike for school and learning because they are frustrated

and humiliated with unresolved reading difficulties. Many students struggle because they

have not developed the automaticity required to be fluent readers (Samuels, 2006).

Fluency is one of the key elements of skilled reading along with identifying words and

constructing meaning.   Mastering fluency is the bridge to becoming a proficient lifelong

reader (Johns & Berglund, 2010). It is hypothesized that combining explicit fluency

instruction with Garage Band audio recording of repeated readings is an efficient and

motivating way to help struggling students to cross the bridge to proficient reading. The

next chapter will continue with a literature review about fluency development and how to

support fluency growth.

Key Terms

Computer Assisted Instruction – educational use of computers where instruction is presented through a computer program to a passive student or the computer is the platform for an interactive and personalized learning environment ("Computer- assisted instruction," 2011).

Echo Reading – a research-based method where the teacher models oral reading by first reading short segments of text and then has the students "echo" what was just read (Caldwell & Leslie, 2009).

GarageBand audio recording - a software application for Mac OS X and iOS, developed by Apple Inc. that allows users to make digital recordings. Typically the application is used to create music and podcasts. ("GarageBand audio recording," 2011).

Listening passage preview – a fluency training method where the student follows along silently while an accomplished reader reads the passage aloud. Then the student reads the passage aloud receiving corrective feedback. ("Listening passage preview," 2011).

Phrase drill error correction – a fluency training method where the student reads a passage and the teacher records error word phrases on index cards. The teacher then has the student read the phrases on the index cards until the student can read all of them correctly. (Joseph, n. d.)

Reading comprehension – a transaction where a reader using life experience and purpose actively constructs the meaning of the printed page. Basic skills required to actively construct meaning include activating prior knowledge, setting the purpose for reading,

predicting, decoding text, summarizing, visualizing, questioning, monitor understanding, clarifying, and reflecting (Wilhelm, 2011).

Reading fluency - that part of the reading process where the reader processes the surface levels of the text (Rasinski, 2009). Pertaining to both oral and silent reading, fluency has four components that include: speed, accuracy, appropriate expression (also known as prosody), and comprehension. On the continuum of reading development, fluency bridges a students' ability to identify words and understand the text (Johns & Berglund, 2010). Students are fluent readers when they can apply the skills of pausing in response to punctuation, divide text into meaningful phrases, make use of intonation and stress, and read at an appropriate pace. When students have successfully integrated these fluency skills, reading becomes automatic and they are able to focus on comprehension of the text (Pinnell & Fountas, 2009).

Repeated reading – a well-researched practice for increasing fluency ability that has the student orally reread short passages until the desirable fluency skills have been attained. Typically the teacher provides guidance and feedback as the student practices the readings (Caldwell & Leslie, 2009).

Sound/Word Boxes – also known as Elkonin Boxes, the teacher says a word and asks the student to write the letter(s) for each sound heard in a row of boxes on the worksheet. This technique supports the development of phonological awareness by helping students to segment words into their constituent sounds (Caldwell & Leslie, 2009).

CHAPTER 2

Federal efforts at improving education in the United States like the No Child Left Behind

Act of 2001 (NCLB) and the Race to the Top competition set up by the American Recovery

and Reinvestment Act of 2009 have put pressure on school districts to develop research

based reading programs that narrow achievement gaps and insure that all students score

in the proficient range on state achievement tests by the year 2014. The National Reading

Panel (2000) identified fluency as one of five necessary components of reading along with

phonemic awareness, phonics, vocabulary, and comprehension. Problems with achieving

fluency in the elementary grades have been demonstrated by a National Assessment for

Educational Progress study (2002) that showed 40% percent of fourth grade students who

received low fluency ratings as also receiving scores in the lower ranges for overall reading

achievement. It was also found in this same study that only 10% of the fourth graders

tested were able to read the reading selection with appropriate levels of accuracy and

expression (NAEP, 2002).   These results suggest the need for teachers to provide an

efficient research based system of fluency instruction and oral reading practice that

promotes the development of proficient levels of reading fluency in the elementary years.

This literature review will address three areas related to helping teachers to understand

fluency development and how to best integrate fluency instruction into the school

curriculum. The first section will address research related to understanding what skills are

needed for successful fluency development and how fluency ability is linked to successful

reading. The second section will focus on research studies about best practices and

combinations of practices for teaching fluency. Finally, the third section will discuss

research related to integrating computer technology into reading/fluency instruction.

Skills Needed for Successful Fluency Development

Planning effective fluency instruction starts with establishing what skills and sub skills

are the necessary components of fluency and the ways in which these skills develop in

children. Since the main purpose of reading is to comprehend, it is important to

understand how fluency is linked to comprehension. The first study reviewed is Speece

and Ritchey (2005), which is a longitudinal study that examined patterns of oral reading

growth in at-risk and not at-risk first grade children. The second study reviewed, Eldredge

(2005), also reviewed and correlated various skills proposed to be sub skills of fluency in

first, second, and third grade children. The last two studies in this section explore the link

between fluency and comprehension.   Tannenbaun, Torgesen, and Wagner (2006)

described the connections between fluent word knowledge and comprehension, and

Applegate, Applegate, and Modla (2009) compared students' fluency rates with their

comprehension abilities.

Speece and Ritchey (2005) point out the lack of research describing just what factors

affect fluency development in the young child. The purpose of their study was twofold.

First, they wanted to show patterns of growth in the oral fluency development of a

combined sample of at-risk and typically developing first grade children. Secondly, they

wanted to identify predictors of growth and level of fluency of the at-risk children.

The units of analysis were fluency and correlates of oral reading fluency growth, which include Rapid Automatized Naming, phonological awareness, word reading efficiency, IQ, teacher ratings of classroom behavior, basic reading skills, and student background. Fluency was measured with a letter sound fluency assessment and leveled reading passages. Rapid Automatized Naming was assessed with the Rapid Automatized Naming Objects subtest from the *Comprehensive Test of Phonological Processing* (CTOPP: Wagner, Torgesen, & Rashotte, 1999). Phonological awareness was measured with the Blending and Elision subtests of the CTOPP. Word recognition was assessed using the Word Reading Efficiency subtest of the *Test of Word Reading Efficiency* (WRE; Torgesen, Wagner, & Rashotte, 1999). Intelligence was measured using four subtests of the *Wechsler Intelligence Scale for Children-Revised* (WISC-R; Wechsler, 1974). In addition, teachers rated student classroom behavior using the *Social Skills Rating Scale-Teacher Version* (SSRS; Gresham & Elliot, 1990), basic reading skills were measured with the Basic Reading Skills cluster of the *WJ-R (*Woodcock & Johnson, 1989), and background variables such as mother's education and chronological age were provided from parent survey.

The data was organized and analyzed using a growth curve analysis to model the growth in oral reading fluency. A second set of analyses was done to compare the differences in growth and level in May between the at-risk sample and the not-at- risk sample. The third set of analyses examined the first and second grade at-risk sample to see if predictions about final level and oral reading fluency could be made using the correlates of growth that were assessed.

The sample consisted of a total of 276 first grade students that were divided into two cohorts of first grade students in two consecutive academic years. The students were enrolled in one of three demographically comparable suburban schools in the Mid-Atlantic States. After giving all first grade students a letter sound fluency assessment, students were identified as at-risk or not-at-risk. Students were identified as at-risk if their performance was at the 25th percentile of their class.   The not-at-risk sample included five students from each class who were performing at the 30th, 50th, 75th, and the 90th percentiles of their class. Students in the at-risk group consisted of 140 children, and students in the not-at-risk group consisted of 136 children. The at-risk group was followed to second grade to provide the longitudinal sample. No significant differences were found between the original sample and the 106 children available to participate in the study in second grade.

To implement the study, fluency measures were administered to all first grade students across 20 weeks from January to May. These same measures were administered weekly in one school, weekly for the first six weeks and then monthly for the remainder of the year in the second and third schools. The other measures were given throughout the year. Oral reading fluency measures were given weekly or monthly in second grade across 34 weeks from November to May.

Results for the combined sample of at-risk and not-at-risk students showed the predicted May oral reading fluency level as 38.17 words per minute and the weekly rate of growth as 1.13 words. The predicted May oral reading fluency level 56.91 words per

minute for the not-at-risk group and 36.92 words per minute for the at- risk group. The

not-at-risk group's predicted weekly rate of growth was 1.50 words per minute increase

per week and, the at-risk group's predicted rate was 0.77.

   First grade growth models for the at-risk sample reflected an increase in fluency growth

across the second half of the year with an overall gradual acceleration of growth. The

conditional growth model of oral reading fluency showed the January oral reading fluency

scores, January letter sound fluency scores, and academic competence highly predictive of

end of the year oral reading fluency performance.

   Second grade growth models showed that the average second grade May oral reading

fluency score was 48.01 words per minute, and the predicted weekly rate of growth was

0.77. While the at risk students had doubled the number of words they could read in 1

minute from first to second grade their rate of progress had slowed from 1.13 words per

minute to 0.77 words per minute by the end of second grade.

   Speece and Ritchey (2005) concluded that the growth curve models in this study

indicate that oral reading fluency in young children is complex and develops gradually.

Their research indicates that by the end of first grade, students identified as at-risk were

reading less than half as many words per minute and growing at about half the rate of their

non-at-risk peers. Students' growth in second grade was found to be less than one word

per week improvement. Speece and Ritchey confirmed their hypothesis that letter sound

fluency was a predictor of oral reading fluency in May for both first and second grade

students in the study. For second grade, their research shows that word level skills become

better predictors of fluency. In addition, first grade oral reading fluency levels were

demonstrated to be predictive of second grade oral fluency levels. Speece and Ritchey

found rapid automatized naming and phonological awareness to be less predictive and

suggested this as being due to the number of other variables related to the reading task

that were also included in the analyses. Despite the limitations of not doing the predictive

analyses with the not-at-risk group, the research from this study shows that reading

fluency problems appear early in reading development which suggests the need to include

fluency instruction in the earliest stages of reading development.

   Speece and Ritchey (2005) found that by the end of first grade young at-risk children

are already reading less than half as many words and growing at half the rate as their not-

at-risk peers. In first grade, letter sound fluency is predictive of later fluency development

whereas in second grade word recognition becomes predictive for later fluency growth.

Despite the limitation of not including the non-at-risk group in the longitudinal sample, this

study suggests the importance of supporting the development of fluency in the early grades

particularly in the areas of letter sound fluency and word recognition. Eldredge (2005)

further adds to the research base on components of fluency development including an

examination of some of the causal relationships in fluency development.

   Eldredge (2005) points our that current definitions of fluency fail to include its

component parts and sub skills.   For this study he chose to explore phonics

knowledge, word recognition accuracy, and reading speed as potential prerequisites

to fluency. The first unit of data analysis in this study was phonics knowledge,

which was measured using three pseudo-word tests that contained nonsense words

based on the graphophonic structure of real words. The second unit of data analysis

was word recognition and was measured with running records with the number of

words read correctly recorded. In addition, word recognition was measured with a

series of word-recognition tests that consisted of 30 words each and contained

regular high frequency words, irregular high frequency words, regular low

frequency words, and irregular low frequency words. The third unit, fluency, was

assessed with timed and taped running records. In addition, another fluency score

was obtained from the word recognition tests by dividing the total number of words

read correctly by the number of seconds taken to read them.

The methods of data analysis used were descriptive statistics and cross-lagged

panel analysis. Cross-lagged panel analysis involves measuring and comparing two

variables at two points in time. This method of analysis is useful for detecting

existing causal relationships and showing the predominance of causation between

the two variables. In this study, Eldredge (2005) constructed cross-lagged panels

between phonics knowledge and word recognition and word recognition and

fluency. Four panels were constructed because of the different instruments used to

measure fluency and word recognition. To insure reliability all testing measures

used the autocorrelations as test-retest reliability indexes.

The sample for this study included 111 first, 117 second, and 76 third graders

attending schools near Brigham Young University in Utah. Students were selected randomly from schools representing all socioeconomic groups. The participants were tested at two intervals nine months apart. The final sample was limited to only those who were present for both testing periods and included 92 first, 92 second, and 49 third grade students.

Participants were tested with all testing measurements in February and November after they had moved to the following grade. All the tests were identical with the exception of the books used for the running records. Tests were individually administered by trained educators and included written instructions to help keep the testing uniform.

The descriptive statistics comparing the mean scores of phonics, word recognition, and fluency all indicated a consistent increase as predicted from one test session to the other across each grade level. There was one exception with the running record fluency tests for the 49 third grade students that indicated no growth over the nine-month period. Results for the third graders showed a contrast between an unchanging mean fluency score of 102.6 words correct/minute and speed and accuracy scores for reading words out of context that showed consistent growth. Eldredge (2005) suggests that this may demonstrate that fluency at this stage is more dependent on having written-word familiarity than being able to read words in context.

Results of the cross-lagged analysis showed a strong causal relationship between

phonics measures in February and word recognition in November. A strong causal

relationship was also found between word recognition in February and fluency in

November. Comparisons of phonics and fluency showed a direct causal path;

however, the correlational differences were not found to be significant.

   Eldredge (2005) concluded that phonics knowledge leads to word recognition

growth and that word recognition growth in turn has a causal impact on reading

fluency. In addition, phonics knowledge is a necessary step in that it leads to better

word recognition, which in turn leads to better fluency. These variables are by no

means to be considered inclusive, but rather some of the prerequisite skills

necessary for optimal development of fluency.

   Studies by Speece and Ritchey (2005) and Eldredge (2005) describe fluency growth as

complex and progressing developmentally from letter sound fluency skills to word recognition

skills. Tannenbaum, Torgesen, and Wagner (2006) explore the connections between vocabulary

development, fluency, and comprehension.

   Tannenbaum, Torgesen, and Wagner (2006) describe three dimensions of word

knowledge – breadth, depth, and fluency. Breadth refers to the number of words in a

person's mental lexicon, depth refers to the degree that the individual understands the

words that are known, and fluency refers to the rate at which the individual is able to

access the meaning of the word. The purposes of this study were to evaluate whether

breadth, depth, and fluency are distinguishable factors of word knowledge, to examine the

strength between these proposed dimensions, and to examine the relationship between

these dimensions and comprehension.

   The units of data analysis for this study were the three proposed dimensions of word

knowledge and comprehension. Breadth of word knowledge was measured with the

Peabody Picture Vocabulary Test, 3rd edition (PPVT-III; Dunn & Dunn, 1997) and the

Vocabulary subtest of the *Wechsler Intelligence Scale for Children, 3rd edition* (WISC-III;

Wechsler, 1991). Depth of word knowledge was measured with the Multiple Meanings and

the Attributes subtests of the *Language Processing Test – Revised* (LPT-R; Richard &

Hanner, 1995). Fluency was measured using the Word Use Fluency (WUF) subtest of the

Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002) and a

specifically designed Semantic Category Fluency test.   Finally, comprehension was

assessed using the *Florida Comprehensive Assessment Test–Sunshine State Standards* (FCAT-

SSS; Florida Department of Education, 2005) and the *Stanford Achievement Test –Ninth*

Edition (SAT–9; Harcourt Assessment, 1996). The test scores from the comprehension

tests were obtained from the school district for each participant in the study.

   The sample consisted of 203 third grade students who attended school in a suburban

school district in a moderately sized southern U.S. city. There were 104 girls and 99 boys

from four elementary schools that were both socioeconomically and ethnically diverse.

Students were not excluded from the study based on handicapped status or English-

Language proficiency.

The procedure involved the administration of the six measures to each participant

individually by either a trained undergraduate student or the first author. To limit error

variance, the tests were given to the participants in two different 60 minute sessions with

the PPVT-III, the Multiple Meanings subtest of the LPT-R, and the Semantic Category

Fluency test given during session one and the Vocabulary subtest of the WISC-III, the

Attributes subtest of the LPT-R, and the WUF subtest of the DIBELS given during session

two.

Methods of data analysis included confirmatory factor analyses, structural equation

modeling, and hierarchical regression analyses. Analysis of the three dimensions of word

knowledge showed with the tests used, it was not possible to discern three dimensions. It

appears that depth and fluency were indistinguishable from each other. Tannenbaum,

Torgesen, and Wagner (2006) suggested that this might be because as the learners gain

deeper knowledge of word meanings, they have multiple experiences with words.

Numerous experiences with words contribute to quicker recalls and access to word

meanings.

Results of the confirmatory factor analyses and structural equation models showed high

correlations between breadth and depth/fluency. This means that providing students with

frequent exposure to many different words would simultaneously allow them to develop

both depth of word knowledge and higher levels of fluency. Structural equation modeling

and hierarchical regression analyses show that breadth of word knowledge is the most

highly related to performance in reading comprehension.

This research implies that when assessing comprehension, measures of both breadth and depth/fluency should be included. It is important to consider that this data was collected concurrently and that while a relationship between these dimensions was established, it would be prudent to follow up with more research of a longitudinal nature.

In this study, Tannenbaum, Torgesen, and Wagner (2006) suggest that the reason depth of word knowledge and fluency are indistinguishable are that similar experiences with words leads to a richer understanding of words and a quicker recall of words while reading. Other important implications of their study are that frequent and broad exposure to vocabulary allows students to develop both breadth of word knowledge and higher fluency levels. In the next study, Applegate, Applegate, and Modla (2009) further explored the nature of the relationship between fluency and comprehension.

Applegate, Applegate, and Modla (2009) observed a trend among their graduate students who were assessing children described as "the best readers" who scored proficiently with fluency but poorly with comprehension.   The researchers noted that teachers might be emphasizing reading rate and word recognition over teaching reading as a meaning-getting process. They also theorized that better automaticity in reading should show higher levels of performance in comprehension among students identified as strong readers. In addition, students who demonstrate high levels of fluency should also demonstrate high levels of comprehension when comprehension is defined and assessed as a thoughtful response to text.

To collect data the researchers used the *Critical Reading Inventory–2* (CRI-2; Applegate,

Quinn, & Applegate, 2008) to measure both fluency and reading comprehension. The

measurement consisted of leveled passages that go from pre-primer through 12th grade. It

included narrative and informational text selections and comprehension questions that

assessed text-based information, inference, and critical response. The assessment also

included a rubric for retelling that included a score for the reader's response to the text, a

computerized program that accurately calculated retelling scores, and a fluency rubric

designed to assess pacing, accuracy, and prosody of oral reading.

The sample for this study consisted of 177 children ranging from grades two through

grade ten who lived in Pennsylvania, New Jersey, and Delaware. One hundred and nine

attended public schools, 45 attended parochial schools, 17 attended private schools, and 2

were home-schooled. 86 % were Caucasian and

14 % were members of minority groups. In addition, participants in the sample were

identified by parents or teachers as strong readers and achieved a score of 16 or higher on

the CRI-2 reading fluency rubric.

To implement the study, graduate and undergraduate students who were trained to

administer and score the CRI-2 audio taped the oral readings of participants as they read

two passages from the CRI-2 at their current grade level. One passage was read orally and

one was read silently. Following the reading, the participant did a retelling and answered

ten open-ended comprehension questions. Examiners also interviewed parents to confirm

parental and teacher assumptions about the participant being a strong reader. Two

experienced CRI-2 users independently crosschecked examiner scores for retellings and

comprehension items. Random samples of 30 audiotapes were crosschecked to ensure

accuracy of fluency scores.

The results of the study revealed that of the 171 children in the sample, only 30%

achieved scores of 85% or higher proficiency with both literal and higher levels of reading

comprehension.   Thirty six percent of the sample had scores ranging from 80% to 63%

indicating some instructional needs in comprehension. In addition, 34% of the sample had

scores of 58% or lower revealing their comprehension to be at struggling levels. Of the 57

participants scoring in the struggling range, 29 scored the lowest on the higher order

comprehension questions by a margin of 30 percentage points or more.

From these results, Applegate, Applegate, and Modla (2009) concluded that there is an

unfortunate tendency for reading proficiency to be judged by students' speed, accuracy,

and prosody without proper consideration of comprehension. Further, the evidence

indicates that there may be more emphasis on activities that promote remembering and

reciting and less practice with activities that develop critical thinking about what is read.

While research shows a correlation between fluency and comprehension, the

interrelationship is complex and requires educators to be cautious about identifying strong

readers based on fluency alone and oversimplifying reading interventions. The findings

from this study challenge fluency theory at both ends of the spectrum from those that

believe fluency facilitates comprehension to those that believe fluency is an outcome of

comprehension. This further underscores the need for continued research and

investigation into the complex interactions that exist between fluency and comprehension.

   The studies in this section illustrate that reading fluency is a multidimensional ability

that gradually develops from the early grades on. Disparities in fluency

 development are present as early as the end of first grade with at-risk

students performing at half the levels of not-at-risk students. Adequate fluency

development is best supported by instruction in such skills as letter/sound relationships,

phonics, and word analysis skills (Speece & Ritchey, 2005; Eldredge, 2005). Helping

students to gain deeper knowledge of word meanings simultaneously helps them to build

both comprehension and fluency levels (Tannenbaum, Torgesen, & Wagner, 2006).

Applegate, Applegate, and Modla (2009) illustrate we must not assume that comprehension

abilities are developing alongside fluency and that teachers need to regularly assess

comprehension along with fluency levels. Reading instruction needs to include practices

that support the development of critical thinking about what is read as well as promote the

development of fluency. Besides understanding the relationship between fluency and

successful reading, teachers must be aware of a variety of best practices to meet the diverse

needs of their students.

Exploring Repeated Readings and Other Best Practices for Improving Fluency

   Perhaps one of the most familiar remedial techniques for improving fluency is

repeated reading. Samuels (1979) described repeated readings as being suitable for any

student to get the practice needed to become automatic. The first two studies in this

section compare repeated reading with other fluency promoting practices.   First reviewed

is Rasinski (1990), who compared repeated reading with the reading-while-listening

approach. The second study reviewed is Homan, Klesius, and Hite (1993) that contrasted

repeated readings with non-repetitive reading strategies. The last two studies in this

section examined the effects of combining repeated reading with other fluency practices.

Devault and Joseph (2004) examined the effect of combining repeated readings with

sound/word boxes, and Martens et al. (2006) examined the effect of combining repeated

readings with phase drill error correction and listening passage review.

    Past research has shown support for both the repeated reading and the listening-while-

reading approaches as methods to improve fluency skill. Repeated reading involves the

student in rereading the same short passage until the desired fluency level is achieved.

Listening-while-reading is similar to repeated reading in that short passages are repeatedly

read, however while reading, the student simultaneously listens to a more fluent model of

the same text. In this study Rasinski (1990) compares the effectiveness of the methods of

repeated reading and listening-while reading in the fluency growth of third grade students.

For the purposes of this study, fluency was defined as reading speed and word recognition

accuracy. The independent variables included a repeated reading treatment and a

listening-while-reading treatment, which was given to all the students in the study. The

dependent variables were two equivalent 100-word fourth grade-reading passages that

were taken from an informal reading inventory.

The sample consisted of 20 third grade students from several elementary schools in a southeastern community in the United States. Students were grouped into ten pairs with input from classroom teachers and standardized testing scores to create ability groups representing high, average, and low reading levels.

To implement the study, each student in each pair received two separate treatment cycles, with each cycle lasting four days. On the first day of each cycle, both students in each pair orally read one of the two test passages, while the researcher audio taped them, recorded WPM, and all miscues. On the second and third days of the cycle using the pretest passage, one student in the pair read to the instructor. The other student in the pair listened to the instructor fluently read the same passage, while silently following along on their own copy.   On the fourth day the students were given the posttest in the same manner as the pretest. The second treatment cycle was given using the second passage and reversing the treatments for each student in the pair. Students were worked with individually, and each repeated reading session and each listening-while reading session was conducted identically for all 20 students in the sample.

Results confirmed that both repeated readings and listening-while-reading methods effectively improved the reading speed and reading accuracy of the third grade students in the sample. There were no significant differences found between the two methods in promoting and improving reading fluency. The evidence from this study supports the uses of both methods in promoting reading fluency and general reading proficiency. With the extensive research and exploration of repeated reading as a best practice for fluency

development, this study demonstrates that the practice of listening-while-reading is a

comparable option. Disadvantages to repeated readings such as extra teacher time to work

one on one and student boredom can be overcome by including such listening-while-

reading activities as listening to tape recorded readings at a learning center. Such activities

would have the additional benefit helping students to be more independent and engaged in

their own reading growth. Evidence from this study also highlights the importance of the

role teachers' play in being models of fluent reading for their students (Rasinski, 1990).

Limitations to this study such as the brief duration of treatment and use of only one grade

level in the sample suggest that further research on both methods is needed.

Rasinski (1990) provides support for repeated reading and listening-while-reading or a

combination of both as practices that are effective in promoting the growth of reading

fluency in children. Homan, Klesius, and Hite (1993) took a closer look at the strategies of

repeated reading and non-repetitive reading strategies.

The practice of repeated reading was developed as a way of helping to strengthen the

automatic decoding skills of struggling readers. Much research has been done on repeated

reading and variations of repeated reading like assisted reading, paired reading, and

listening-while-reading to establish them as practices to support gains in reading rate and

accuracy. Homan, Klesius, and Hite (1993) questioned whether students reading improved

from the repeated reading practice or from the increased amount of time spent reading

connected text. One of the purposes for their study was to see if the methods of repeated

reading and non-repetitive oral reading strategies like echo reading and unison reading

contributed to gains in overall reading performance. The other purpose was to see if there

were any significant differences in the effects of the two practices on reading performance.

The independent variables were the repeated reading and the assisted non-repetitive

treatments. The dependent variables were six pre- and posttest passages taken from an

informal inventory and a basal series. An additional dependent variable was a retell

assessment based on the story structures of the passages. The passages consisted of two

sets (Forms A and B) that included three readings at the fourth, fifth, and sixth grade

reading levels.

The sample included 26 sixth graders that attended a chapter one program at two

racially balanced schools in a large metropolitan area. Students in the sample were reading

at a high fourth grade to low fifth grade level.   The 26 students were chosen from three

classrooms and then randomly assigned, 13 students each, to either the repeated reading

treatment or the assisted non-repetitive strategy treatment.

To begin the study, Form A or Form B of the pretest was given to each student. The

students were told they would be recorded during the assessment and would be asked to

retell the stories after they read them. Three teachers who were trained in both practices

implemented the treatments. During the one and a half hour language arts block, each

teacher worked with a small group of four to five students in each treatment group for 20-

minute sessions, three times a week. The posttest was given during the eighth week using

the same directions, but with the students receiving the alternate form from the one they

had during the pretest. The same researchers recorded the students' pre and posttest

passages to insure consistency in computing reading rate and accuracy. For the comprehension portion, two raters were trained and then independently scored and transcribed the retellings.

A multivariate analysis showed no significant differences between groups at pretest for reading rate, error rate, or comprehension.   Significant differences were found between pre and posttest scores for all subjects. Both treatments show significant improvements in comprehension, but there were no significant differences between the repeated reading and non-repetitive treatments.

The results show that both repeated reading and non-repetitive reading methods improved the fluency (rate and accuracy) and comprehension of sixth grade chapter one students. Homan, Klesius, and Hite (1993) concluded that reading growth also occurred as a result of the students' focus on connected text reading for three 20- minute sessions over a seven week period. Having found no significant differences between repeated reading and non-repetitive reading methods, the authors recommend flexibility in choosing the method that best helps students to gain the necessary focus on connected reading to improve both fluency and comprehension.

Rasinski (1990) and Homan, Klesius, and Hite (1993) both found no significant differences between repeated reading and non-repetitive practices like unison reading and listening while reading. These findings support the use of a variety of practices to promote fluency and comprehension growth. Devault and Joseph (2004) examined the effect of combining repeated reading with a word box phonics technique.

Devault and Joseph (2004) were interested in finding ways to help high school students with low reading ability. The purpose of this study was to find out if using repeated readings with the phonics strategy of sound/word boxes would be a motivating and effective combination for helping high school students with severe reading disabilities. The independent variables in this study were a combination of curriculum-based repeated readings and use of the sound/word box strategy. Dependent variables included the *Dynamic Indicators of Basic Early Literacy, 6th ed. (*DIBELS, Good & Kaminski, 2002) and the pre and post word per minute scores of the curriculum based grade level passages that were used as repeated readings in the intervention sessions.

The sample consisted of three secondary level students who were identified in the elementary years as having learning disabilities and who were receiving special education services in the areas of reading and language arts. One male student had an IQ score of 94 and attended regular education classes for everything but reading and math. The other male student had an IQ score of 57 and received special education services for both reading and math. The female student had an IQ score of 94, received special education services for reading only, and had suffered a seizure disorder that had caused her to miss a lot of school during the previous school year. IEP testing showed the three students' reading levels as ranging from first to second grade level. All three students were identified by their classroom and special education teachers as non-readers, had no expectations for them to read in class, and had all assignments and tests read to them.

To implement the study each student was given the DIBELS to determine his/her independent reading level. Each student received individual direct instruction from an instructor for 15-25 minutes for five days a week. At the beginning of each session the student read a curriculum-based reading passage that was at his/her current instructional level for one minute. The instructor recorded all words read incorrectly or omitted on index cards and went over each word using the sound/word box strategy. The sound/word box strategy involved the teacher modeling and slowly articulating the sounds in each word and then having the student slide the corresponding letters into the divided sections of a rectangle drawn on a dry erase board. The student reread the reading passage again after completing the word box activity, while the instructor recorded the words missed and the number of words read correctly per minute. A new passage was chosen and the same procedure implemented for each intervention session. The DIBELS was repeated at the end of the treatment sessions as post assessment.

Results of the study showed that all three students made gains in the number of words read correctly per minute from the initial to the repeated reading. Devault and Joseph (2004) also noted an increase in the number or words read correctly per minute on the initial reading although this progress was not consistent across sessions. The DIBELS post assessment revealed an increase of two grade levels for each student. The researchers also reported a positive student response to using the sound/word box technique and improvements with student confidence and willingness to read. Although this study had a small sample and did not include assessment for comprehension, Devault and

Joseph (2004) concluded that combining explicit instruction such as the sound/word box

technique with repeated reading appear to be effective practices to help promote

progression to higher reading levels for secondary students with severe reading delays.

    Although Devault and Joseph's (2004) sample only included three students, it was useful

research to support combining fluency development strategies as a way of providing

interventional instruction to students with severe delays. It was noteworthy that high

school students found the use of sound/word boxes and repeated readings as acceptable

and motivating ways to help them improve their reading. The last study reviewed in this

section is Martens et al. (2007) who examined the effects of combining several fluency

promoting practices in training sessions included as part of an afterschool program.

    Martens et al. conducted a study that had three purposes. The first purpose was to

compare the effects of fluency training using a no treatment control group. The second

purpose was to determine how many training trials were needed for a student to reach a

mastery criterion on reading passages, and the final purpose was to assess how long

students were able to retain their fluency gains over time. The independent variable in this

study was the fluency-training program, which included three instructional procedures,

performance feedback, and a reward system. Dependent variables included Curriculum-

Based Measurement in Reading (CBM-R) survey level probes, which were pre- and posttest

passages derived from the Silver, Burdett, and Ginn (1991) reading series. Passages were

created for pre-primer through fourth grade levels.   A Words Read Correctly/Minute

(WRC/M) score was obtained from timing the participants as they read the passages. This

score was computed by dividing the number of words read correctly by the total time in seconds to read the passage multiplied by 60. A second dependent variable was the *Comprehensive Test of Phonological Processing* (CTOPP; 1999), which is a test for children ages 5.1 years to 24.1 years that measures phonological awareness, phonological memory, and rapid memory. The last independent variable was the *Academic Competency and Intervention Acceptability Assessment* (ACIAA), which was used to assess the participants' perceptions of the fluency-training program after it was over.

The sample in this study consisted of ten second graders (7 female, 3 male) and 20 third graders (13 female, 7 male) who attended a northeastern urban elementary school's after school program. These students were selected from a larger pool of 72 students that attended the program based on having a standard Phonological Awareness Composite score of 65 or higher using the CTOPP and reading below instructional level using the CBM-R probes to determine reading level. The second graders ages ranged from 7.01 to 8.02 years and the third graders ages ranged from 8.04 years to 10.0 years. All students were eligible for free or reduced-price lunch with one student self-identified as Latino/Hispanic and the rest self-identified as African American.

To start the study all participants were given the CTOPP and the CBM-R probes. Using the CBM-R probes the participants' starting points in the curriculum were determined as the probes that were read between 50 and 100 WRCM. Participants were then randomly assigned to either the group receiving fluency training or the control group. The study was conducted over a seven-week period for the second graders and over eight weeks for the

third graders. This included a week for pretesting at the beginning of the study and a week

for post-testing at the end of the study for each grade.

During the training session weeks, participants from the experimental group were

pulled from their regular after school program to attend one 30-minute session on

Mondays, Wednesdays, and Fridays. The session included a pre-training assessment that

determined the level of passage where the 100 WRCM criterion was not met, fluency

training on the passage, and a post-training assessment. The sessions were audio taped to

allow assessment of inter-scoring agreement and to check procedural integrity.

The fluency training included reward tickets participants could exchange for prizes, a

graph where trainers and participants kept track of progress, and training in phrase drill

error correction, listening passage review, and repeated reading.   Participants had to read

the previous session's passage at 100 WRCM on the pre-training assessment two days later

to progress to the next more difficult passage.

Participants in the control group remained in their regular after school class. Their

activities included snack, language arts activities, and worksheets.

Results of this study showed that the second grade and the third grade participants

made significant gains over the control group on the CBM-R survey level probes. Second

grade participants gained 22.76 WRCM after training on the same day and 21.55 WRCM on

the two-day retention probes. Through the five weeks of their training they advanced 2.2

grade levels or 8.8 passages. They averaged 2.21 trainings to master each passage.

Third grade participants gained 24.52 WRCM after training on the same day and 26.4 WRCM on the two-day retention probes. They attended training sessions for 5 1/2 weeks, advanced an average of 2.9 grade levels, and took an average of 1.69 trainings to master each passage.

Results of the ACIAA indicated that the second graders had a more favorable perception of reading at the post-test than the control group. Third graders in both the experimental and control group reported favorable perceptions of reading at the post-test. Both second and third grade students in the experimental group reported liking the training procedures.

The researchers recognized that their sample was small and limited to second and third grade students. The training required a minimum of four adults to help individual students progress through the passages at their own rate. Despite these limitations the researchers concluded that a targeted fluency program that is closely matched to students instructional levels could produce significant gains in oral reading fluency.

Both Devault and Joseph (2004) and Martens et al. (2007) demonstrate positive fluency growth utilizing multiple strategies. Devault and Joseph (2004) showed that using repeated readings together with word/sound boxes could effectively and quickly help delayed readers in high school advance to higher levels of text.   Martens et al. demonstrated that combining fluency building strategies (i.e. phrase drill correction, listening passage review, and repeated reading) with student self monitoring and rewards can effectively support growth of up to two grade levels in three 30 minute sessions over a five week period.

To summarize this section, the studies of Rasinski (1990) and Homan, Klesius, and Hite (1993) support the use of repeated readings and other non-repetitive practices like unison reading and listening-while-reading. No significant differences were found between repeated reading and other non-repetitive approaches. These results suggest fluency and comprehension growth are best supported when teachers provide students with a variety of instructional alternatives that build word recognition, reading rate, and comprehension through regular practice of connected text (Homan, Klesius, & Hite, 1993). Reading tasks that are purposeful and relevant like reading to younger children, having students chart their own reading rate progress, and having students make audio tapes for the listening center keep students motivated and more engaged in getting the practice required to reach instructional goals. While repeated readings have been demonstrated to be effective, students are further supported in fluency growth by combining such practices as sound/word boxes, phrase drill error correction, and listening passage review in a direct instruction format (Devault & Joseph, 2004; Martens et al., 2007).

Besides understanding how fluency develops and what instructional practices best support fluency growth, teachers need to find ways to integrate the necessary practice required to help students develop their fluency and comprehension abilities into the busy and tightly scheduled school day. In addition, teachers need instructional systems that allow them to monitor student progress and allow students to observe and monitor their own reading. One way to do this efficiently is to integrate the use of computer technology.

The final section of this literature review looks at studies that have incorporated the use of

computer technology into the instruction and practice of reading skills.

Incorporating Computer Technology into Reading (Fluency) Instruction

    With the rapidly changing nature of computer technology, it is difficult to find current

studies on the use of computer technology in reading instruction. There is a great need to

do more research to support the effective use of computer technology as teachers face

increasing constraints in time and resources, and must find reliable ways to cover their

students' diverse needs. Computer technology offers students opportunities to gain

additional, structured practice of reading skills independently of teaching staff (Macaruso

& Rodman, 2009). The studies in this section investigate the effect of computer technology

on reading achievement. The first study, Knezek and Christensen (2007) took a look at the

effect of technology-based programs on the reading achievement of first and second grade

students. The second study, Macaruso and Rodman (2009) examined the benefits of

computer-assisted instruction for struggling readers in middle school. The third study,

Lewandowski, Begeny, and Rogers (2006) compared the effects of human tutoring and

computer-assisted word recognition training on third grade students. Finally, the fourth

study, Savage, et al. (2010) explored how teacher variations in the use of web technology

affected student growth in literacy.

        Knezek and Christiansen (2007) utilized data gathered from the Key Instructional

Design Strategies (KIDS) project, a five-year, federally funded study conducted from 1999 –

2004 that was aimed at integrating computer technology into the elementary school

curriculums of fifty Texas school districts.   The data used was collected during the fourth

year of the project and focused on the effect the Early Reading Center portion of the KIDS

technology had on K – 3 reading achievement. The independent variable in this study was

the implementation of the Early Reading Center technology including teacher training and

the installation of necessary computer technology components at the participating school

districts. The dependent variables consisted of scores obtained from the Texas Primary

Reading Inventory (TPRI), a state assessment already given each year at Texas elementary

schools to measure individual student growth in reading achievement in the areas of

phonemic awareness, word reading, reading fluency, and reading comprehension. Fall and

spring TPRI scores were used as pre and post test results.

  The sample was chosen from the pool of Texas school districts that met the criteria of

having 42% of students receiving free or reduced lunches, having a student population of

1000 or fewer, and having a Texas Education Agency rating of below "Recognized". Eligible

schools were then randomly assigned to 18 treatment school districts and seven control

school districts.   Due to the small number of kindergarten classes participating in the KIDS

grant, only first and second grade data were included in the sample.

   Each participating school district in the treatment group received professional

development for its teachers, access to the necessary hardware/software, and use of the

Early Reading Center modules. Each treatment district sent a five member training team to

a summer institute that immersed them in workshops that trained them on how to use the

technology, helped them plan what technology they needed to purchase for their district

with the allotted grant money, and guided them in writing a plan of action for

implementing the Early Reading Center technology into their district. Prior to the start of

the school year, the team trained fellow educators in implementing the Early Reading

Center modules and technology enhanced tools. Schools received additional support from

KIDS project staff members who visited and communicated regularly with the schools

throughout the year. Skills addressed by the Early Reading Center included oral language

development, awareness of sound, symbol, and structure, skill integration, reading

comprehension strategies, vocabulary, spelling, and writing. Upon completing the TPRI as

a pretest in all participating schools, students in the treatment group schools worked on

completing the high-interest technology-based reading modules. Students in the control

group schools received regular non-technologically based reading instruction. The study

concluded with the spring administration of the TPRI to all treatment and control school

participants.

   TPRI data was gathered by mailing forms to the participating districts where each

classroom teacher or district representative filled in the participating children's TPRI raw

scores. A spreadsheet was created from the completed forms based on a coding scheme

previously designed by the researchers. For the pretest, completed forms were received

from 40 first-grade classrooms and 41 from second-grade classrooms. For the posttest, 33

completed forms were received from first-grade classrooms and 33 from second-grade

classrooms. Pretest and Posttest data were aligned to match 434 first-grade students and

453 second grade students.

Results for the first grade analysis show that the students in the treatment group that

received the technology enhanced instruction made significant gains over the control

group in the areas of whole classroom reading level, word lists, reading accuracy, and story

level. There was no significant difference found between the two groups in the area of

answering implicit and explicit comprehension questions. Results for the second-grade

students showed a significant gain in reading accuracy for the treatment group. Whole

classroom reading level scores were significantly higher for the second grade treatment

group also. In addition, comprehension of implicit and explicit comprehension questions

was also significantly greater for the treatment students. In comparing the findings for first

grade with second grade, the results show reading accuracy gains similar for both first and

second grade with treatment students gaining more than the control students. In

comparing raw score means and standard deviations for each group at the pretest and

posttest time frame, it was noted that each group made moderate to very large gains, but

that the pre-post effect was greater for the treatment group. Knezek and Christensen

(2007) concluded that the Key Instructional Strategies (KIDS) professional development

and the technology enhanced learning activities successfully promoted gains in reading

accuracy for both first and second grade students and reading comprehension at the

second grade level.

Knezek and Christensen (2007) demonstrated that implementing intensive, high interest

computer based instruction with adequate professional development can be effective in

promoting reading accuracy and comprehension for primary aged students. The next

study takes a look at how computer-assisted instruction can benefit middle school students.

In this study, Macaruso and Rodman (2009) wanted to find out if the use of computer-assisted instruction (CAI) could be effective as a supplement to a language-based literacy skill program for struggling older readers. The independent variable was a CAI program that provided structured, multisensory activities designed to develop word identification skills in older readers. The dependent variables consisted of an assessment battery taken from the *Woodcock-Johnson III Tests of Achievement (*Woodcock, McGrew, & Mather, 2001) that was given as a pre and posttest. The subtests used included Word Attack, Letter-Word Identification, Reading Fluency, Reading Vocabulary, Passage Comprehension, Oral Comprehension, and Spelling.

Participants for the study were 47 sixth and seventh grade students enrolled in a remedial program at a middle school in St. George, Utah. Students were referred to the program through teacher referral or by receiving a low score on the *Developmental Reading Assessment* (Beaver & Carter, 2003). Each student was randomly placed in one of three of the remedial classes with 27 students (15 male, 12 female) in the treatment group and 15 students (7 male, 8 female) in the control group. Both groups had comparable IQ scores, similar ethnic profiles, and were of low to middle range in socioeconomic status.

After giving all students the pretest, all received whole class instruction using a comprehensive, language-based literacy skills program and fluency instruction. The treatment group received the fluency instruction in small group format to allow time to

rotate use of the CAI program that focused on developing phonological awareness and

phonics skills. CAI sessions for the treatment group occurred 2 to 3 times a week and

lasted for 20 -30 minutes. For these sessions students were instructed to work quietly and

independently and were allowed the freedom to choose the activities within the level they

were on. Treatment and control groups all received the same amount of direct instruction

time. Treatment groups received an average of fifty CAI sessions per student over the

school year. All students were then given the posttest at the end of the school year.

   Macaruso and Rodman (2009) found that the treatment and control groups both had

significant gains for Passage Comprehension. The treatment group also made significant

gains on Word Attack and Letter-Word Identification. When mean gain scores on the

subtests where compared using analyses of covariance, the treatment group showed a

significantly more improvement on the Word Attack subtest over the control group.

Significant correlations were found between the pretest scores and the gain scores for the

Word Attack and Letter-Word Identification subtests. Negative correlations for this

comparison reveal that students with lower pretest scores made greater gains on the Word

Attack and Letter-Word Identification subtests. There were no significant correlations

found for the control group. The researchers concluded that the treatment students' gains

were due to the CAI program with the lower performing students showing the greatest

gains. Benefits of CAI programming are contingent upon choosing programming that

supports student growth in the areas of weakness as this program did in the area of

phonics.   Struggling students can make significant gains through the use of CAI

programming when it is appropriately implemented and utilized as a key part of reading

instruction.

Successful utilization of computer technology requires professional training and careful

planning to make sure students are receiving instruction and practice of skills in their areas

of weakness. In the next study, the authors looked at whether word list training is better

when done with computers or with human tutoring.

Lewandowski, Begeny, and Rogers (2006) discussed the importance of helping

students to develop automaticity in word recognition. Interventions for this problem have

been studied and debated as to whether whole word approaches or phonic, alphabetic

approaches are best. Research suggests that word recognition growth can be achieved

with direct instruction methodology that provides multiple opportunities to see, hear, and

say the words being taught. The purpose of this study was to compare the effects of using

human tutors vs. computer assisted instruction to provide direct instruction in word

identification and fluency building. In addition, the researchers looked at whether this

these training conditions would show transfer to a non-target list and to reading passages

containing the target words. Independent variables included three treatment conditions

where students studied a list of 100 words with a tutor, with a computer, or by themselves

with no help. There were three dependent variables. The first consisted of having the

participants read the 100 word-training list and scoring for time and accuracy. The second

dependent variable was to have the students read a total of ten graded passages that

contained words from the word-training list and scoring words read correctly per minute.

The third dependent variable had the participants read from a generalized word list where

they were scored for time and accuracy.

The sample consisted of 66 third grade students who attended an elementary school in

central New York that was enrolled in a reading project. The average age of students in the

sample was 9.3 years, and there were 37 females and 29 males. The ethnic distribution

included 19 Caucasian, 28 African American, 6 Asian, 4 Hispanic, and 9 mixed. Special

Education Services were provided to 14 of the participants and 59 were eligible for free or

reduced cost lunch. Following the pretesting, students were randomly assigned to one of

the three treatment conditions. The three groups were comparable in distribution of age,

sex, race, and socioeconomic status and did not show any differences at pretest in word

recognition or reading fluency.

For the study, the researchers had prepared ten reading passages (two from each grade

level) from a basal reading series with an average length of 127.9 words. Using readability

scores the pairs of passages were graded at the following levels:

1.5, 2.3, 3.4, 4.4, and 5.3.   A training word list was developed by choosing 5 -10 words

ranging in length from 4 – 12 letters. The generalization word list consisted

of 100 words chosen for their similarity to the 100 words on the training word list.

To start the study each participant was pretested by a trained graduate student. Students

read the training word list, each of ten passages for one minute each in randomized order,

and the generalized word list. Participants were assigned to one of the three conditions

and were given a total of three sessions of exposure to the trained word list. In each

condition the student went through the list two times and then had an oral timed reading

of the list. For the computer condition, the students saw a word in a textbox and heard the

computer pronounce the word. The student was guided to work at his/her own pace, see

and hear the word, and say it silently. For the tutoring condition, the tutor read each word

and scrolled down the list with a finger. Students were also guided to look at each word,

listen to the tutor pronounce it, and say it silently. For the control condition, the

experimenter did not help the student to read the words, but scrolled down the list as the

student practiced each word. The three training sessions lasted ten minutes per

participant and occurred over a three-week period. Post testing was completed following

the training sessions.

   To insure reliability, each experimenter received training in curriculum-based

measurement reading procedures and was able to demonstrate a 95% proficiency at inter-

rater scoring.   A percentage of the testing sessions were recorded and re-scored and found

to be 98.7% for inter-rater reliability. Procedural integrity was found to be 99.6%. Results

for the training list showed significant improvement for the computer and tutor groups, but

not for the control group. There was not a significant difference between the tutoring and

the computer groups. All groups were able to reduce the time it took to read through the

trained word list from pretest to post test. None of the groups made any significant

improvement from pretest to post test for the generalized word list. Results of the passage

reading   show significant improvement from pretest to post test for the tutor and the

computer over the control group. There were no significant differences between the tutor

and computer groups. Lewandowski, Begeny, and Rogers (2006) concluded that human

tutoring and computer training provided better support for word recognitions gains over

the control condition where students read the words to themselves. Tutoring provided the

advantages of direct instruction, human attention, error-free modeling, and attention

focusing. Computer assisted practice provided error-free sight and sound word

associations in an interesting and efficient format for both teachers and students.   The

authors mentioned the small and limited nature of this study and recommended more

research to explore the effects of tutor and computer assisted word training over a longer

period.

   Although this study was of a small, limited nature, it is interesting that there were no

significant differences found between the word recognition training being done with the

computer or the human tutor. These results support computer-assisted practice as a

reasonable option to help students practice such fluency skills as word recognition

(Lewandowski et al. 2006). The last study reviewed in this section took a close look at the

impact of teacher variations of implementing computer technology on the outcomes of

student reading achievement.

        With the ever-increasing implementation of computer and information technology

into the classroom setting there is limited information available on how computer

technology can be best used by teachers to maximize student learning.

Sandholtz, Ringstaff, and Dwyer (1997) found that teachers pass through developmental

stages as they learn to integrate technology into their classrooms. The first three stages

they described are entry, adoption, and adaption. During the entry stage teachers are less

familiar and tend to make time-consuming mistakes sometimes leading to minimal or

ineffectual use of the technology. As teachers reach the stage of adoption, they become

more familiar with the technology and begin to implement it more systematically into

classroom practice. The adaption stage is where the teacher achieves more mastery and is

able to implement and extend the technology more fully into the school curriculum. The

authors of this study wanted to find out if a well researched web-based literacy program

known as *A Balanced Reading Approach for Canadians Designed to Achieve Best Results for*

All (ABRA; http://abralite.concordia.ca) could show similar results in supporting reading

achievement when administered teachers in a regular classroom setting.   They also

wanted to find out if there were differences in reading achievement when classroom

teachers who were at different learning stages of technology implementation administered

the ABRA program.

   The independent variable was the ABRA intervention given between pre- and post tests.

One dependent variable was a measure of letter-sound knowledge where students were

asked to identify the sound that goes with each of the 26 letters in the alphabet. Other

dependent variables included the skills of listening comprehension, word reading, sentence

comprehension, and passage comprehension, which were assessed with a standardized

reading test called the *Group Reading Assessment and Diagnostic Evaluation* (GRADE;

Williams, 2001).   In addition, spelling was assessed with a spelling test taken from the

Wide Range Achievement Test (Wilkinson, 1993), word attack skills were assessed with a

subtest from the *Woodcock Johnson III Test of Achievement* (Woodcock, McGrew, & Mather,

2001), and elision and word blending were assessed with subtests from the *Comprehensive*

Test of Phonological Processing (Wagner, Torgesen, & Rashotte, 1999).   The Arithmetic

subtest from the *Wide Range Achievement Test* (Wilkinson, 1993) was given as a control

task. Besides these reading skills, triangulation data was collected from four different

observations of the teachers as they implemented the ABRA technology in their classrooms.

   The sample consisted of four first grade classrooms from three English-speaking schools

in a suburban school district in Quebec, Canada. Four teachers volunteered for the study

after a school board request for participation in the study. Sixty students, 32 boys and 28

girls, were recruited through parental letters. The mean age of participants was six years,

five months.

   To implement the study one teacher was randomly assigned to the control condition that

engaged in literacy programming that did not involve computer technology. The other

three teachers received a one-day training on how to implement the ABRA program into

their classrooms. The teachers were presented with sample lessons and teacher materials

to support them in using ABRA as part of a balanced literacy program. Following the two-

week pretesting period, the teachers implemented the ABRA web based literacy program

for two hours a week for eight consecutive weeks. The three teachers had access to an

ABRA facilitator to provide technical support in implementing the ABRA program.   The

teachers were entirely responsible for all teaching and lesson planning in the classrooms.

Throughout the eight-week period, four different types of observations were done to

evaluate the teachers' performance and quality of instruction as they used the ABRA

program. First researchers conducted hour-long observations twice in each classroom.

Two other members of the research team independently rated these written narratives to

insure reliability. Another source of observation data was submitted in the form of weekly

written observations by the ABRA facilitators as they gave technical support in the

classrooms. The third source of data came from a focus group meeting where the ABRA

teachers, facilitators, and two research coordinators discussed their experiences with the

ABRA program. Finally, the last source of observational data came from researcher

evaluations of sample lessons the teachers were asked to present at the focus meeting.

After eight weeks, the three intervention classes and the control class were given the

posttests.

Results of the teacher observations revealed that there were differences in the ways that

the teachers implemented the ABRA program that fit into the technology implementation

stages described by Sandholtz et al, 1997. One teacher, identified as in the entry stage

appeared to show signs of frustration at using the technology, had difficulty working out

the technical problems in implementing the program, and tended to provide instruction

that was student directed rather than teacher directed. One teacher fit the characteristics

of the adoption stage by demonstrating more comfort with using the technology, assigning

the students to work in groups with precise directions on what to do, and spending 15 – 20

minutes collaboratively working on computer activities with the whole class using the big

screen. The third teacher was identified as functioning at the adaption stage. In addition to

having the students work together in centers, giving whole group demonstrations on the

big screen, the third teacher was able to link and extend the ABRA content to other parts of

the literacy curriculum.

    After running an Analysis of Covariance (ANCOVA) on the pre-test scores, it was found

that there were no statistically significant pre-test differences between the students in each

of the three intervention classrooms and the one control classroom.

A series of ANCOVAs done on the post testing showed significant effects between the three

identified technology integration stages and the scores for Word Reading, Word Meaning,

the Combined Vocabulary composite, and the elision task. There was an advantage found

for the adoption group in the areas of Word Meaning and the Vocabulary composite over

the control and the entry groups. In all cases there was a significant advantage over all the

other groups for the Adaption group. Results of the GRADE test showed significantly

higher scores for students in the adaptive teacher's group in the areas of Sentence

comprehension, the Comprehension composite score, and the Total Test score. The

adoption group did not differ from the entry group on the comprehension measures in this

test. There were no significant differences found between any of the three treatment

groups or the control group for the measures of Letter-Sound knowledge, Listening

Comprehension, Passage Comprehension, Spelling, Word Attack, Blending, or Arithmetic.

The researchers concluded that the ABRA web-based literacy program could support the

growth of students in standard measurements of reading achievement. Computer

technology promotes literacy growth most effectively when teachers have expert level

technology skills, have well thought out lesson plans, and can extend skills covered by

computer technology to the larger curriculum. Students benefit the most when teachers

provide frequent feedback and act as facilitators in the intervention. Teachers are

successful in providing help to students when they receive training and have ongoing

support in implementing the technology. Savage et al. (2010) acknowledges limitations of

this study due to the small sample size of three teachers and 60 students. This study

highlights the need for larger scale studies that explore the relationships between teachers'

mastery of technology and student learning outcomes.

   In summary, Knezek and Christensen (2007) reported that despite the conservative

effect size in their study, computer assisted technology that is implemented with

professional development and provides high interest literacy learning activities can

successfully support growth in reading accuracy for first and second grade children and in

reading comprehension in second grade children. Macaruso and Rodman (2009) found

computer assisted instructional programming supported the greatest gains in the lowest

performing middle school students, but observed that it was necessary to customize the

computer instruction to support the areas of greatest need. Although Lewandowski,

Begeny, and Rogers (2006) found no significant differences in word training done with

computers over tutors, the study demonstrates computer technology as a reasonable

option to help students improve word recognition skills. Finally, Savage et al. (2010) found

that despite their small sample size, teachers who can expertly integrate and extend

computer technology into the larger literacy curriculum support greater gains in overall

reading achievement.

Summary

It is evident from the literature review that fluency is a vital part of exemplary reading

instruction. Research shows that fluency development differences show up as early as first

grade with at-risk children performing half as well as their not-at-risk peers (Speece &

Ritchey, 2005). There are strong causal relationships between phonics knowledge, word

recognition, and fluency (Eldredge, 2005). Furthermore, fluency and the understanding of

word meanings develop simultaneously from broad and frequent experiences with words

(Tannenbaum, Torgesen, & Wagner, 2006).   The relationship between fluency and

comprehension is complex. Teachers should not assume fluency instruction covers

comprehension and be sure to also include practices that develop critical thinking of what

is read (Applegate, Applegate, & Modla, 2009).   The literature review also shows that

fluency and comprehension are best supported by a variety of practices including repeated

reading and non-repetitive strategies like unison reading (Homan, Klesius, & Hite, 1993;

Rasinski, 1990;). In addition, combining fluency building practices into intensive training

sessions that include some explicit word recognition strategies like word/sound boxes and

repeated reading can help students with severe reading delays (Devault & Joseph, 2004;

Martens et al, 2007). Finally, the literature review provides some evidence that teachers

can effectively promote fluency skills like word recognition and accuracy with expert

implementation of computer technology that is matched to students' areas of need (Knezek

& Christensen, 2007; Macaruso & Rodman, 2009; Lewandowski, Begeny, & Rogers, 2006;

Savage et al., 2010).

Finding ways of supporting intermediate aged students in becoming fluent readers is of

high priority as the 2014 proficiency deadline set by the No Child Left Behind Act of 2001

approaches. The research reviewed clearly establishes the importance of including

fluency-building instruction in a balanced reading program. More research is warranted in

the future to investigate how to include computer technology in reading instruction that

promotes fluency development. This study will contribute to the need for research on

using such computer applications as GarageBand audio recording to help students practice

repeated readings in conjunction with explicit fluency building instruction. In chapter

three, the methodology utilized for the current study will be presented.

CHAPTER 3

The purpose of this study was to develop an after school tutoring intervention that focused on providing intensive fluency training and gave students a motivating way to practice newly learned skills by making computer audio recordings of themselves practicing repeated readings. This chapter presents the methodology used to answer the research question, "What is the effect of combining explicit fluency instruction with computer audio recording of repeated readings on the fluency and comprehension growth of intermediate aged students?" The chapter will start with a description of the research setting and the participants. Next details will be given about the materials used and the procedure that was followed. Then there will be an explanation of how the data was collected. Finally, the chapter will conclude with a summary of the main points.

The Research Setting and Participants

The study took place at the researcher's private learning center created to provide an additional afterschool and Saturday morning tutoring option for struggling students in the community. The center is located in a growing suburban Wisconsin community with a school district that serves about 7000 students having seven elementary schools, two middle schools, an upper middle school, and one high school. Located on the main street and near three of the elementary schools, the office was set up as a small student friendly resource/classroom with a variety of leveled reading materials, a small table for one on one instruction, and a desk set up as a computer station. Participants for the study were recruited through private advertisement and e-mail communication sent to area

elementary teachers and reading specialists. Parents that were interested in having their child participate in the study were then referred to the researcher.

The recruitment efforts yielded three Caucasian male students – one-third grader and two fourth graders, which will be identified as Student A, Student B, and Student C.

Student A

Student A was nine years old and in 3rd grade. His mother had been looking for extra help for her son outside of school. She communicated that it was hard to get her son motivated to practice reading and completing homework on his own at home. His mother reported he was reading at Level M the 3rd quarter of the year. According to school district expectations, third graders should be reading between levels N – P at the 2nd interval assessment done in February. This indicated Student A was performing below grade level expectations and in need of intervention. The initial sessions with Student A revealed him to be an easygoing young man who worked cooperatively and eagerly on all tasks given to him. His slow word identification and reading accuracy stood out as contributors to his slower reading rate and comprehension abilities. He was very motivated to use the Garageband program to audio record his reading.

Student B

 Student B was in fourth grade and was ten years old. His parents had been looking for a private tutor for additional support and were concerned that their son's reading difficulties were related to Attention Deficit Disorder. He had been referred and was currently being assessed at school for special education services. His parents reported him as reading at

Level M. According to district expectations, fourth graders should be reading between

Levels Q and S after the 2nd interval assessment done in February, showing a strong need

for intervention. Currently Student B was receiving intervention services from the reading

specialist at his school. During the first sessions with Student B, it became apparent that he

had a short attention span and needed the lessons to be well structured. He worked very

well one on one and was motivated to make the audio recordings of his reading. His weak

vocabulary knowledge and inattention to detail appeared to contribute greatly to his

fluency and comprehension abilities.

Student C

 Student C was also in fourth grade and was ten years old. His parents reported that

reading difficulties ran in their family and that their son did not like reading on his own at

home. His parents reported him as reading at Level R, which according to district

expectations indicated he was meeting grade level expectations for fourth grade. Student C

had been going to the reading specialist at his school to work on issues of slow, non-fluent

reading. Initial sessions with Student C showed him to be a very conscientious student that

was able to focus carefully on what he was reading, however he struggled with

automaticity in word identification and tended to slow himself down with frequent

repetitions. Lack of automaticity, word identification difficulties, and frequent repetition

all contributed to his non-fluent reading and lowered comprehension.

   The following section will continue with a description of the materials used for the

intervention and the procedure that was followed.

Materials and Procedure

The study was designed to work one on one with each student for a total of 16 one-hour

sessions, which included two pretest sessions, 12 instructional sessions, and two posttest

sessions. After completing the pretest assessments, each student received the intervention.

Each of the intervention sessions began with a fluency mini lesson that focused on different

fluency skills and concluded with a practice portion where the student used the computer

to audio record himself doing repeated readings of the passage used in the mini lesson.

The materials used for the reading passages and mini lessons were taken from

Increasing Fluency with High Frequency Word Phrases (Knoblock, 2007) and *Read-Aloud*

Passages and Strategies to Model Fluency (Mann, 2007). Each lesson included a short 150 to

200-word passage, several vocabulary and comprehension questions, and an explanation

of a specific fluency skill such as watching for punctuation or learning to find the natural

breaks in sentences. All the lessons that were taken from *Increasing Fluency with High*

Frequency Word Phrases (Knoblok, 2007) had a CD recording of the passage for the

students to listen to. For the lesson that was taken from *Read Aloud Passages and Strategies*

to Model Fluency (Scholastic, 2007), the researcher read the passage while the student

listened. Other materials used for the practice portion of the lesson included a MacBook

computer with the Apple GarageBand program installed, a Snowball USB microphone,

student-monitoring sheets, and teacher feedback sheets. In addition, there was a Student

Oral Reading Rubric designed by the researcher to help guide the students in critiquing

their own reading.

   Each new intervention lesson began with the researcher and student listening to the

passage being read from the CD or the researcher reading while the student listened to the

passage. For the second reading the researcher and the student used the technique of

partner reading to read the passage.   Following the reading, the researcher and student

discussed and answered the comprehension and vocabulary questions to insure that the

student understood what the passage was about. Next, the student was instructed on the

particular fluency skill that was included with the lesson. When the mini lesson was

completed, the student moved over to the computer station to practice incorporating the

skill taught using the repeated reading technique with the same reading passage used in

the mini lesson. The student was trained on how to make computer audio recordings using

the Apple software program, GarageBand. The training included learning how to hook up

the microphone, how to start up the GarageBand program and prepare for recording, how

to label, number, and save each reading, and how to replay each recording. The goal was to

audio record the passage at least two times using the Apple GarageBand program during

the practice portion of the session.

   At the beginning of the practice portion, the student was asked to state a goal for his

reading practice, which he recorded on his student sheet. The researcher also recorded the

student's goal on a teacher sheet. After playing back and listening to the first recording, the

researcher and student had a discussion on how the reading sounded and what the student

could do to improve it. The student revised his goal and recorded the reading a second

time. After listening to the second recording, the student rated his reading performance,

and evaluated whether he successfully incorporated the new skill. The researcher also

rated the reading and gave the student feedback. The student and researcher recorded this

information on their respective monitoring sheets and concluded the session. Following

each session, the researcher reviewed the recordings, graphed the reading rate and errors

for the set of repeated readings, recorded observations about the student's lesson and

reading, and planned the next lesson. Subsequent sessions began with a discussion of what

the student remembered from the previous mini lesson and repeated reading practice.

Students were progressed to the next lesson/passage after one or two intervention

sessions. As each student completed twelve intervention sessions, he was given the

posttest assessments concluding his participation in the study.

The next section will give a description of the assessments and other data that was

collected before, during, and after the intervention.

Data Collection

Data collected from this study included pre and posttest administration of *The*

Qualitative Reading Inventory – 4 (QRI-4; Leslie & Caldwell, 2006). The QRI-4 is a

comprehensive, research-based reading inventory that assesses reading skills from

elementary through high school. The inventory provides leveled word lists and reading

passages that reflect the narrative and expository reading materials used in schools and

covers word identification, reading fluency, and comprehension. Students read graded

word lists and four leveled passages, were asked to retell what they read, and answered

implicit and explicit comprehension questions.

In addition to the QRI- 4, the study participants were given the interest inventory, *Tell

Me What You Like* (McKenna & Stahl, 2009).   The inventory asked students to assign a

letter grade from A to F as a teacher gives letter grades to the different topics listed (i.e.

sports, spiders). The study participants were also given *The Reader Self-Perception Scale*

(RSPS; Henk & Melnick, 1995). The RSPS is a 33-item assessment of self-esteem and

motivation in reading. Students are asked to indicate how strongly they agree or disagree

with each statement on a five point scale (5 = strongly agree and 1= strongly disagree).

Both of these assessments were given at pretest and posttest.

During the intervention, the data collected included the computer audio recordings of

the repeat readings that were reviewed after each session to determine Word Per Minute

rate (WPM) and errors. The student monitoring sheets and teacher feedback sheets

provided an ongoing record of student goals, fluency ratings, and teacher feedback to the

student.

Summary

In conclusion, this chapter describes the methodology used to investigate the research

question, "What is the effect of combining explicit fluency instruction with computer audio

recording of repeated readings on the fluency and comprehension growth of intermediate

aged students?" Three intermediate age male students received a total of 16 one-hour

sessions of tutoring each, which included two pretest sessions, 12 instructional sessions,

and two posttest sessions. The intervention began with a mini lesson where the student

practiced reading a 200-word passage using the techniques of listening while reading and

partner reading. The mini lesson also included comprehension discussion and instruction

in specific fluency skills. The second half of the intervention included practice of repeated

readings using computer audio recording with the researcher and student critiquing the

student's reading performance. Data collected included pre and posttest results of the

QRI-4, an interest inventory, and a self-perception reading assessment. Records of ongoing

growth were collected in the form of WPM rates and errors from the repeated readings,

student responses on the student monitoring sheets, and researcher responses on the

teacher's feedback sheets. The next chapter will report the results of the assessments and

summarize the data.

CHAPTER 4

This chapter will report the results of the study that investigated the research question,

"What is the effect of combining explicit fluency instruction with computer audio recording

of repeated readings on the fluency and comprehension growth of three intermediate aged

students?" First, the pretest and posttest results of the *Qualitative Reading Inventory - 4*

(QRI-4; Leslie & Caldwell, 2006) from each of the participants will be presented. Next the

results from the interest inventory, *Tell Me What You Like* (McKenna & Stahl, 2009) will be

presented. Then the results of the *The Reader Self-Perception Scale* (RSPS; Henk & Melnick,

1995) will be presented.   The chapter will continue with a report of the participants

reading speeds measured in Correct Words Per Minute (CWPM) for the repeated readings

done during the intervention. Finally, a synopsis of the student responses and teacher

observations collected during the intervention will be reported. The chapter will conclude

with a summary of the main points.

QRI-4 Results

Student A showed slight gains in his reading of the third and fourth grade word lists

from pretest to post test. As indicated in Table 1, Student A scored in the independent

range for both the first grade and second grade word lists. He read 95 % of the first grade

words automatically with a total score of 100%. He read 90% of the second grade words

both automatically and totally. At the third grade level, Student A scored in the

instructional range, identifying 70% of the words both automatically and totally. Student A

scored in the frustration range at the fourth grade level, identifying 50% of the words in the

list automatically and 60% totally. After the intervention, Student A maintained the same

score of 95% for automatic, but lost 5% on his total word identification. At the second

grade level, he read 5% less automatically, but gained 5% more in the total score. At the

third grade level, he had a 5% gain for both the automatic and total scores. Finally, at the

fourth grade level, Student A maintained his 50% automatic score, but gained 10% for his

total score.

Table 1

QRI-4: Student A's Word List Accuracy

Level	% Automatic Pretest	% Automatic Posttest	+/-	% Total Pretest	% Total Posttest	+/-
1	95	95	0	100	95	-5
2	90	85	-5	90	95	+5
3	70	75	+5	70	75	+5
4	50	50	0	60	70	+10

Student A's passage reading results showed positive gains from pretest to posttest on all

four passages in the area of accuracy. As indicated in Table 2, Student A's pretest passage

reading scores showed that his total passage level for the first grade narrative passage was

at the instructional level with a score of 96% for total accuracy, a CWPM rate of 75, a recall

of 56%, and a comprehension score of 100%. Student A also read the second grade

expository passage at the instructional level reading with 94% accuracy, a CWPM rate of

63, a recall of 45%, and a comprehension score of 100%. Student A read the third grade

passage at the frustration level with 95% accuracy, a CWPM rate of 63, a recall of 49%, and

a comprehension score of 62%.   The fourth grade narrative passage was also in his

frustration range with an accuracy score of 92%, a CWPM rate of 28, a recall of 10%, and a

comprehension score of 38%.

   Posttest results on Student A's reading of the first grade narrative passage showed a 3%

gain in accuracy, a 34 word increase in CWPM rate, and a 12% increase in recall. Student A

gained 2% in accuracy on the second grade expository passage, but had decreases of 9

words for CWPM, 2% for recall, and 46% in comprehension. For the third grade passage he

had increases of 2% for accuracy and 38% for comprehension, but decreases of 5 words for

CWPM rate and 7% for recall. Lastly, Student A showed improvement in all areas for the

fourth grade passage with increases of 3% in accuracy, 23 words in CWPM rate, 30% in

recall, and 25% in comprehension.

Table 2

QRI-4: Student A's Passage Reading

Level	1 N		2 E		3 N		4 N	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
% A	96	99	94	96	95	97	92	95
CWPM	75	109	63	54	64	59	28	51
% R	56	68	45	43	49	42	10	40
% C	100	100	100	54	62	100	38	63

N = Narrative, E= Expository, A= Accuracy, CWPM= Corrected Words Per Minute, R=Recall, C= Comprehension

Student B made positive gains from pretest to post test in his word list accuracy for the

first, second, and fourth grade word lists. As indicated in Table 3, he scored in the

instructional range, receiving a score of 85 % both automatically and totally on the first

grade word list. For the remaining three word lists he scored in the frustration range. He

read 45% of the second grade words automatically and 60% totally. At the third grade

level, Student B identified 50% of the words automatically and 55% totally.   At the fourth

grade level, Student B identified 40% of the words in the list both automatically and totally.

After the intervention, Student B read the first grade list in the independent range with a

score of 90% both automatically and totally. He read the second grade level in the

instructional range with 75% read automatically and 80% read totally showing gains of

30% and 20% respectively.   At the third grade level he had a 5% loss for both the

automatic and total scores. Finally, at the fourth grade level, Student B gained 10% with his

automatic score and 15% with his total score.

Table 3

QRI-4: Student B's Word List Accuracy

Level	% Automatic Pretest	% Automatic Posttest	+/-	% Total Pretest	% Total Posttest	+/-
1	85	90	+5	85	90	+5
2	45	75	+30	60	80	+20
3	50	45	-5	55	50	- 5
4	40	50	+10	40	55	+15

Student B's passage reading results showed the most consistent growth in the area of CWPM rate from pretest to posttest.   As indicated in Table 4, Student B's pretest passage reading scores showed that his total passage level for the first grade narrative passage was at the independent level with a score of 97% for total accuracy, a CWPM rate of 69, a recall of 56%, and a comprehension score of 100%. Student B read the second grade expository passage at the instructional level with a score of 93% for accuracy, a CWPM rate of 59, a recall of 46%, and a comprehension score of 50%.   He was able to bring his comprehension score up to 100% with look backs for that passage. Student B also read the third grade narrative passage at the instructional level with 91% accuracy, a CWPM rate of 32, a recall of 49%, and a comprehension score of 88%. He also increased his comprehension score to 100% with look backs on this passage.   Student B read the fourth grade narrative passage at the frustration level with an accuracy score of 91%, a CWPM rate of 27, a recall of 17%, and a comprehension score of 75%.

After the intervention, Student B's accuracy score on the first grade narrative passage stayed the same, but his CWPM rate increased by 9 words. He scored 11% lower for recall and 17% lower for comprehension on the first grade passage. On the second grade expository passage, Student B had a 3% gain on his accuracy score and an 11 word increase in his CWPM rate. His recall score was 17% less, but his comprehension score showed a 25% gain. On the third grade narrative passage, Student B gained 5% on his accuracy score and 29 words for his CWPM rate. His recall was 15% less and his comprehension score stayed the same. On the fourth grade narrative passage, Student B's accuracy, recall, and

comprehension scores stayed the same, while his CWPM rate increased by 17 words. He

increased his comprehension scores to100% on all the passages with look backs.

Table 4

QRI-4: Student B's Passage Reading

Level	1 N		2 E		3 N		4 N	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
% A	97	97	93	96	91	96	91	91
CWPM	69	78	59	70	32	61	27	44
% R	56	45	46	29	60	45	17	17
% C	100	83	50	75	88	88	75	75

N = Narrative, E= Expository, A= Accuracy, CWPM= Corrected Words Per Minute, R=Recall, C= Comprehension
_____

Student C showed gains in his reading of the first, third, and fourth grade word lists

from pretest to post test. As indicated in Table 5, Student C scored in the independent

range for the first grade word list with an automatic score of 90% and a total score of

100%. He performed at the instructional level on both the second and third grade

passages. On the second grade word list he received an automatic score of 85% and a total

score of 90%, and on the third grade word list he scored at 80% both automatically and

totally. Student C scored in the frustration range for the fourth grade list with an automatic

score of 45% and a total score of 55%. After the intervention, Student C increased his score

to 100% both automatically and totally on the first grade list. He scored 10% less

automatically and 15% less totally on the second grade list. On the third grade list, he

gained 5% on his automatic score and 10% on his total score. Finally, on the fourth grade

list, Student C showed a 25% increase automatically and a 30% increase totally.

Table 5

QRI-4: Student C's Word List Accuracy

Level	% Automatic Pretest	% Automatic Posttest	+/-	% Total Pretest	% Total Posttest	+/-
1	90	100	+10	100	100	0
2	85	75	-10	90	75	-15
3	80	85	+5	80	90	+10
4	45	70	+25	55	85	+30

Student C's passage reading showed slight improvements in all areas for the first grade

narrative passage and in the area of accuracy for the second grade expository passage. As

indicated in Table 6, Student C's pretest passage reading scores show that he read the first

grade narrative passage in the independent range with an accuracy score of 98%, a CWPM

rate of 57, a recall score of 48%, and a comprehension score of 100%. Student C read the

second grade expository passage in the instructional range with an accuracy score of 84%,

a CWPM rate of 67, a recall score of 35%, and a comprehension score of 100%. He also

read the third grade narrative passage in the instructional range with an accuracy score of

97%, a CWPM rate of 56, a recall of 66%, and a comprehension score of 88%. Student C

scored in the frustration range for the fourth grade narrative passage with a score of 97%

for accuracy, a CWPM rate of 56, a recall of 15%, and a comprehension score of 88%.

He increased his comprehension score to 100% on the third grade passage with look backs.

     After the intervention, Student C showed a 1% gain in accuracy, a 13-word increase in

CWPM rate, and a 22% increase in recall on the first grade narrative passage score. On the

second grade expository passage he gained 13% in accuracy, but decreased in CWPM rate

by 14 words, in recall by 9%, and comprehension by 12%. On the third grade narrative

passage, Student C maintained the same scores from pretest to posttest for both accuracy

and comprehension. However, he read the third grade passage 9 words slower and

recalled 36% less of the passage. Finally, for the fourth grade narrative passage, Student C

scored 7% less for accuracy and 27 words less for CWPM rate.   Student C showed a 25%

increase in recall and increased his comprehension scores on all four passages to 100%

with look backs.

Table 6

QRI-4: Student C's Passage Reading

Level	1 N		2 E		3 N		4 N	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
% A	98	99	84	97	97	97	97	90
CWPM	57	70	67	53	56	47	56	29
% R	48	70	35	26	66	30	15	40
% C	100	100	100	88	88	88	88	88

N = Narrative, E= Expository, A= Accuracy, CWPM= Corrected Words Per Minute, R=Recall, C= Comprehension

A comparison of the QRI-4 results for all three students indicated some growth but in different areas for each student. As indicated in Figure 1 and Figure 2, all students either maintained or slightly improved their word list accuracy scores in both the automatic and total scores.
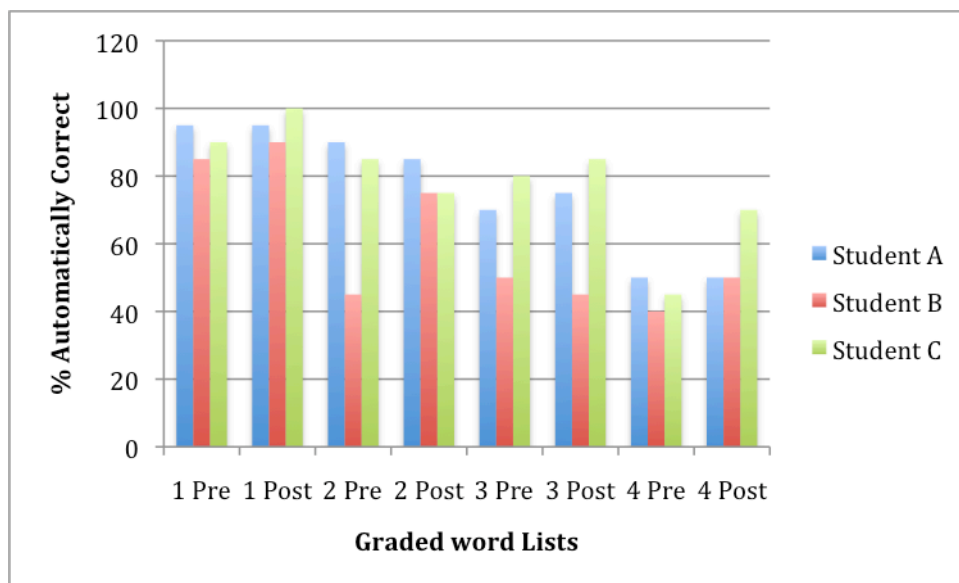

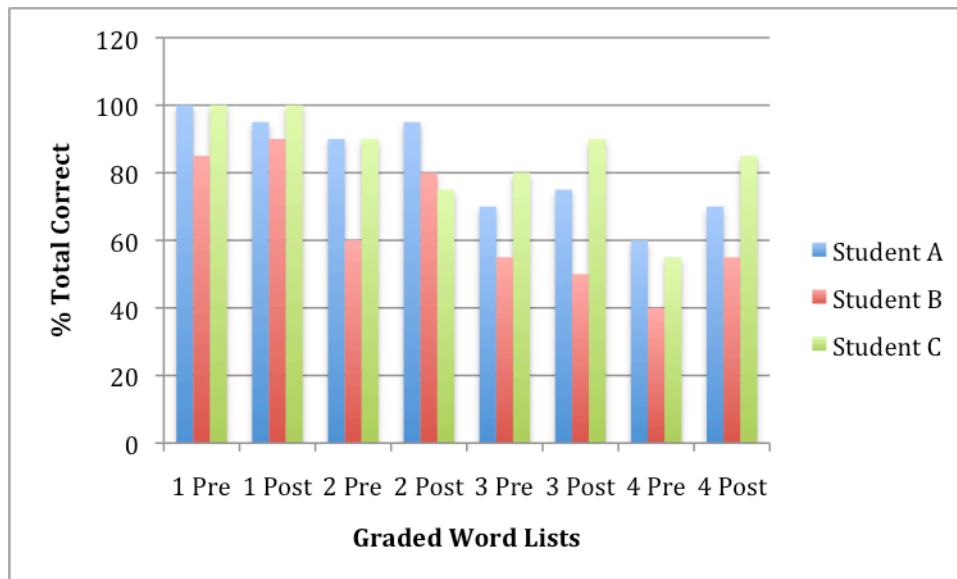*Figure 1. Comparison of Word List Accuracy (Automatic Score)*

Figure 2. Comparison of Word List Accuracy (Total Score)

All three students showed growth from pretest to post test in their Accuracy % scores on

the passages. As indicated in Figure 3, Student A showed gains on his reading of all four

passages. Student B showed growth on his reading of the second[d] and the third grade

passages, and Student C showed growth on his reading of the first and second grade
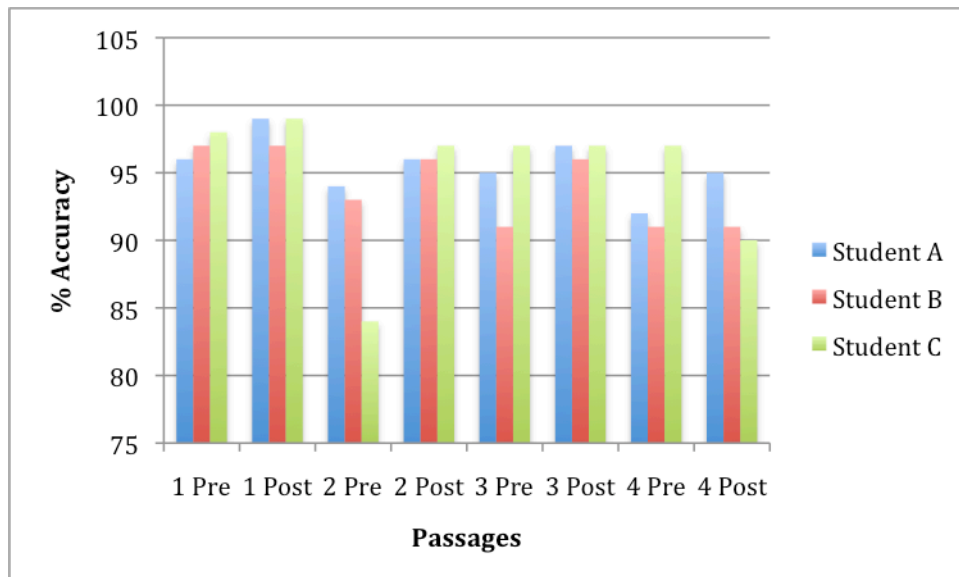
passages.

Figure 3. Comparison of % Accuracy on the passages

In the area of CWPM, Student B showed gains on all four passages. As indicated in Figure 4, all students showed gains from pretest to post test on the first grade passage. Student A showed growth on the first and fourth grade passages.
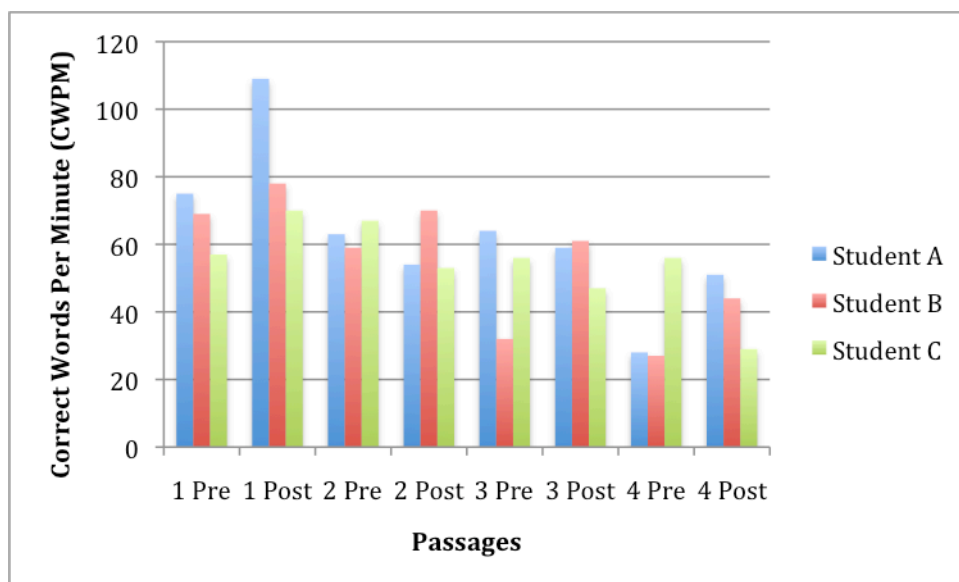

Figure 4. Comparison of CWPM rates on the passages

Finally, the students showed some improvement in the areas of recall and comprehension. As indicated in Figures 5 and 6, Students A and C improved on their recall for both the first grade and the fourth grade passages. Student A showed gains on his comprehension score for both the third and fourth grade passages, and Student B showed a gain on the second grade passage. The next section will report the data collected from the interest inventory, *Tell Me What You Like* (McKenna & Stahl, 2009) for each participant.
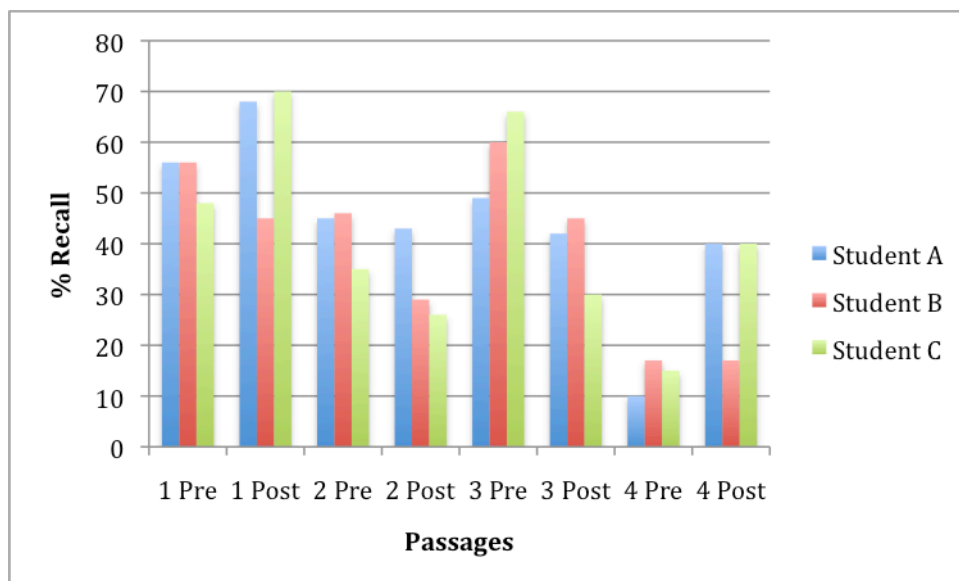

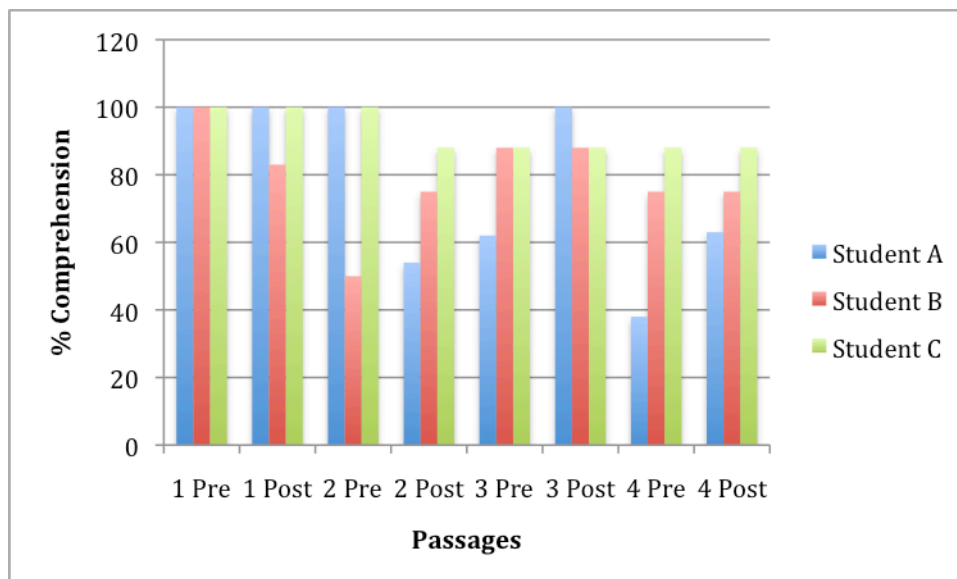*Figure 5. Comparison of % Recall from the passages*

Figure 6. Comparison of % Comprehension from the passages

Results of the "Tell Me What You Like" Survey

This data was collected for the purpose of getting to know the participants and to help in selecting high-interest reading passages for the intervention. Students were given a list of 32 topics and asked to assign letter "grades" from A to F for each topic with A indicating it was a favorite topic and F indicating it was a least favorite topic. Table 7 shows the A topics chosen by each of the participants.

Table 7

*Results of "Tell Me What You Like" Survey*_____

Student A	Student B	Student C
A Topics	**A Topics**	**A Topics**
Sports	Animals	Sports
Sharks	Sharks	Camping
Camping	UFO's	Drawing
Spiders	Snakes	Friendship
Snakes	Fishing	Fishing
Fishing	Dogs	Love
Monsters	Cats	Countries
Ghosts	Families	Dogs
Ocean	Computers	Families
Music		Computers
Cats		
Families		
Computers		

_____

Each student displayed a range of interests with all three indicating interests in the

topics of Families and Computers.   The next section continues with a report of

the results obtained from *The Reader Self-Perception Scale.*

Results of the Reader Self-Perception Scale (RSPS)

The RSPS is designed to assess how children perceive themselves as readers.   The

results of this assessment did not indicate much change in the students' self-perceptions of

their reading from pretest to posttest. As indicated in Table 8, Student A received a score of

40 in the area of Progress, which is in the high average range. His Observational

Comparison score of 21 and his Social Feedback score of 35 were both in the average range.

His Physiological States score of 29 fell into the low average range.   After the intervention,

Student A's scores remained in the high average range for Progress, moved to the low average range for Observational Comparison and Social Feedback, and moved to the low range for Physiological States.

Table 8

The Reader Self Perception Scale Pre and Post test results

	Progress		Observational Comparison		Social Feedback		Physiological States	
	P	T	P	T	P	T	P	T
Student A	40	42	21	19	35	31	29	17
Student B	35	31	18	17	30	30	21	25
Student C	36	45	16	25	28	31	21	24

P = pretest   T = Posttest
_____

Student B scored 35 for Progress, 18 for Observational Comparison, and 30 for Social Feedback. All of these scores were in the low average range. He scored a 21 in the area of Physiological States, which is in the low range. At posttest he scored 4-points lower for Progress and 1-point lower for Observational Comparisons. His Social Feedback score of 30 remained the same and his Physiological State score increased by 4-points.

Student C scored 36 for Progress, 16 for Observational Comparison, 28 for Social Feedback, and 21 for Physiological States. These scores were in the average to low range. Student C's posttest scores showed gains in all areas with a 9-point gain for Progress, a 9-point gain for Observational Comparisons, a 3-point gain for Social Feedback, and a 3-point gain for Physiological States.

In summary, results for the RSPS showed that Student A's self perception stayed in the

high average range from pretest to posttest in the area of Progress. In the areas of

Observational Comparison, Social Feedback, and Psychological State, his scores were

slightly lower after the intervention. Student B's posttest scores were slightly lower in the

areas of Progress and Observational Comparison, stayed the same for Social Feedback, and

increased slightly for Physiological States. Student C showed the most consistent

improvement from pretest to posttest in all areas with 9-point gains in the areas of

Progress and Social Feedback. The next section will continue with a report of the reading

rates the participants received on the repeated readings done during the intervention.

CWPM Rates of Repeated Readings

As indicated in Figure 7, Student A's CWPM scores showed improvement from the first

to the second recorded readings with the exception of the third repeated reading where he

scored the same each time. His average gain for the nine repeated readings he recorded

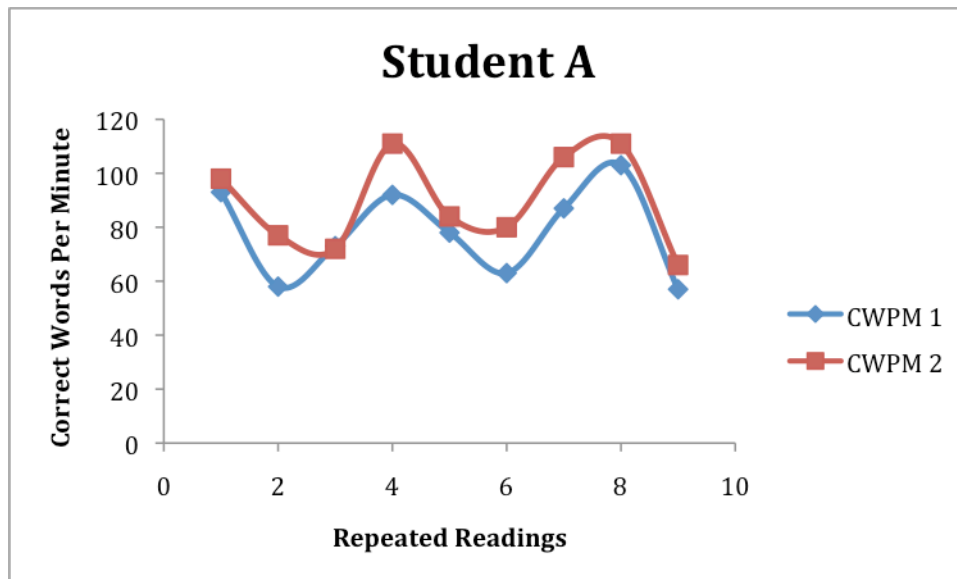during the intervention was 11.2 CWPM.

Figure 7. CWPM rates of Student A's GarageBand repeated readings

As indicated in Figure 8, Student B's CWPM scores showed positive gains with the exception of the third reading, where he also scored the same CWPM score for both recordings. Student B was only able to record eight repeated readings during the intervention. He had an average gain of 12.9 CWPM on his recorded readings.
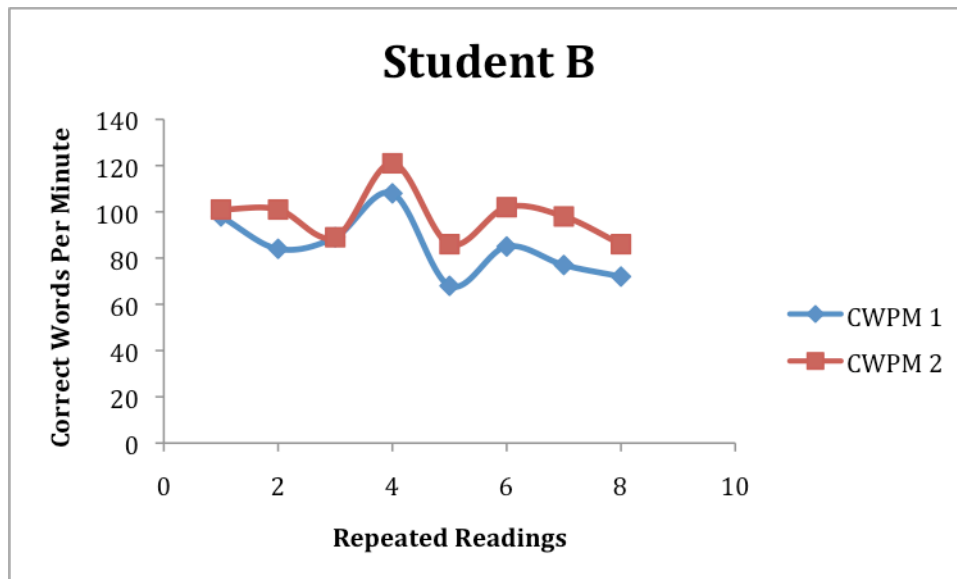
Figure 8. CWPM rates of Student B's GarageBand repeated readings

As indicated in Figure 9, Student C showed greater CWPM gains as he completed his fifth

recording, losing 14 CWPM on the third reading and scoring the same score for the fourth

reading. His average gain on the 9 readings he recorded during the intervention was 9.6
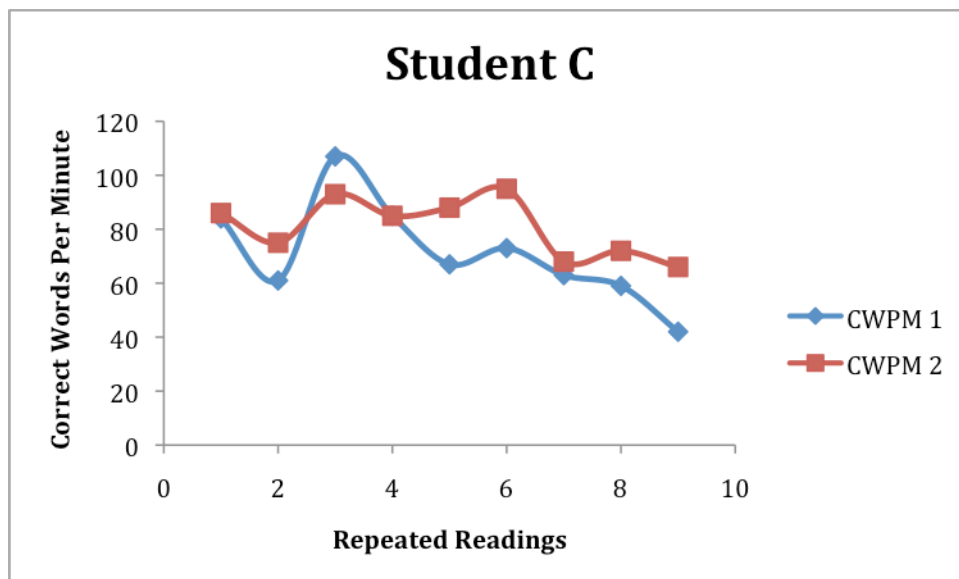
CWPM.

Figure 9. CWPM rates of Student C's GarageBand repeated readings

In summary, all three students made positive CWPM gains from the first to the second

repeated readings that were computer audio recorded during the intervention. The third

reading appeared to be a challenge for all three students with Students A and B scoring the

same on both readings and Student C scoring lower on the second reading. The next

section will continue with a synopsis of the student responses and teacher observations

recorded during the intervention for each participant.

Student Responses and Teacher Observations of the Intervention Lessons

During the intervention sessions, the students listened to 150 to 200 word

passages that were either read from a CD or by the researcher. The passage was read a

second time with the researcher using the technique of partner reading. The lessons

continued with a comprehension discussion about the passage and a specific teaching point

about reading fluency such as reading with expression or watching for punctuation. For

the last 30 minutes of the intervention, the student practiced the passage as a repeated

reading and audio recorded himself using the Apple GarageBand program on the

researcher's computer. Prior to recording, the students were asked to record in their own

words what they just learned and their goal for reading that day. After listening to their

recordings, they were asked to rate their fluency according to the fluency rubric that was

explained to them at the beginning.

 While both students and researcher did their best to rigorously cover all the steps in

this intervention, there were a few occasions where the student sheets were overlooked or

filled out quickly. What was recorded added some insight into the thinking processes of

the student after receiving the direct fluency instruction and as he practiced the new skill.

For example, Student A recorded after Lesson 1 that you should "make your voice go up

when you see a period or comma." On the rubric for that lesson he recorded, his rate,

expression, and phrasing to be a 3 and his puncutuation to be a 4. The researcher recorded

that the student "had some expression and is enthusiatic about the reading" and recorded a

3 for rate, phrasing, and punctuation, and a 4 for expression. Later during Lesson 5, he

wrote, "I want to sound like a real reporter." The researcher recorded that Student A

"seemed more confident and sounds like he's talking directly to listeners."

 In another example from the first lessons, Student B recorded, " Reading is fun, and it is

not hard." He recorded 3 for rate, 2 for expression, 4 for phrasing, and 2 for punctuation.

The researcher recorded, " You read it so you could follow the story too," and rated the

reading as 3 for both rate and phrasing , and 2 for both expression and punctuation. During

lesson 5, Student B recorded, "in a story with a dialogue, you can use your voice to show something like teasing." He recorded a 4 for his expression in that reading. The researcher recorded, "student is starting to relax and use his voice to help tell the story."

Finally, Student C wrote during Lesson 4 that "you need to think about what is going on in the story." He gave himself a 3 for rate, and 2's for expression, phrasing, and punctuation. For Lesson 4, the researcher recorded that Student C had "very accurate reading, made up good voices for the characters, and followed the punctuation." Teacher ratings for that reading included a 2 for rate, and 3's for expression, phrasing, and punctuation. Later in Lesson 6, Student C wrote that "paying attention to punctuation" was his goal. He recorded a 2.5 for rate, a 3 for expression and phrasing, and a 3.5 for punctuation. The researcher recorded that "Student C is following puncutation, is adding much more feeling/mood, and is reading with more confidence."

To summarize, the student responses and teacher observations provided evidence that the students were engaged and thinking carefully about how to make their reading sound more fluent throughout the intervention. The students were able to articulate several of the main teaching points covered during the first part of their intervention such as "adjusting your voice when you see punctuation", "making your voice sound like a reporter", "adjusting your voice for characterization", and "paying attention to what is going on in the story". The researcher's observations also revealed evidence that the students were attempting to make their reading more fluent while still following the

meaning of the passage, and that the students were reading with more confidence. The

next section will summarize the results for the whole chapter.

Summary

   In conclusion, results from the QRI-4 showed some positive gains from pretest to post

test in the areas of accuracy for Students A, B, and C. Student A showed some gains in

comprehension. Student B also showed improvement in the area of comprehension, while

Student C showed some improvement in recall. The results of the *Tell Me What You Like*

Survey revealed that all three students had a range of interests with Families and

Computers being in common for all three. The results of *The Reader Self-Perception Scale*

did not reveal a change in the students self –perceptions of their reading from pretest to

post test. The CWPM rates of the readings recorded during the intervention indicated

ongoing positive growth during the intervention with Student A gaining an average of 11.2

CWPM, Student B gaining an average of 12.9 CWPM, and Student C gaining an average of

9.6 CWPM. Finally, student responses and teacher observations provided evidence of

ongoing reading growth during the intervention as students were able to articulate in their

own words key ideas learned about reading fluently, like adjusting your voice and watching

for punctuation. The teacher observations identified examples of target reading behaviors

such as "the student is using his voice to help tell the story" and "the student is watching for

punctuation." The findings presented above showed that an after school tutoring

intervention with a focus on intensive fluency training combined with GarageBand audio

recording of repeated readings resulted in positive growth in fluency and comprehension

in intermediate-aged students. A discussion of the findings is presented in the next

chapter.

CHAPTER 5

Intermediate-aged students that struggle with reading fluency issues such as difficulty with word recognition, slow reading rate, and inability to read with expression are at high risk for academic failure. A 1995 National Assessment of Educational Progress (NAEP) report on oral reading found that 44% of fourth graders in the sample scored at the lowest fluency ratings and read grade level text at word per minute rates of 89 or below (Pinnell et al., 1995). Research has identified a relationship between low fluency ratings and lower scores on general measures of reading achievement (Pinnell et al, 1995). In the report of the National Reading Panel, fluency was listed as one of five critical components of reading alongside phonemic awareness, phonics, vocabulary, and comprehension (National Reading Panel, 2000). Wisconsin Common Core Standards (2010) list fluency as a foundational skill with the expectation that students will "read with sufficient accuracy and fluency to support comprehension." With ever-increasing pressure to narrow achievement gaps and insure that all children reach proficient levels in reading, it is essential that teachers step up their efforts to provide differentiated instructional strategies that support the development of adequate levels of fluency for the students they teach.   This chapter will first include a summary of the intervention. Then there will be a discussion of the findings of this study. Next there will be a discussion of the strengths and limitations of the study. Following that will be a discussion of implications for future research. Finally, the chapter will end with a conclusion and closing reflections for the entire study.

Summary of the Intervention

The purpose of this study was to find out if a one hour after school reading intervention that

included explicit fluency instruction and computer audio recording of repeated readings would

improve the fluency and comprehension skills of intermediate aged struggling readers. The

researcher met individually with one third grader and two fourth grade struggling readers for

twelve one-hour sessions after school that were paced at one to two sessions per week from April

- June 2011. Each session started with a fluency mini lesson that included a short 150 to 200-

word passage, several vocabulary and comprehension questions, and an explanation of a

specific fluency skill such as watching for punctuation or learning to find the natural breaks

in sentences. The second part of the session included a practice portion where the student

used the Apple software application GarageBand to computer audio record the same

passage as a repeated reading. The student made two recordings of each passage. The

student monitored his reading by recording reading goals, listening to his repeated

readings, and rating his fluency. The researcher also listened to the repeated readings and

gave feedback to the student.   The research-based practices that were incorporated into

the intervention included listening while reading, partner reading, direct instruction,

repeated reading, corrective feedback, student monitoring, and computer audio recording.

Many research studies have shown that fluency and comprehension growth are

successfully supported when teachers provide students with a variety of instructional

alternatives, (Devault & Joseph, 2004; Homan, Klesius, & Hite, 1993; Martens et al. 2007;

Rasinski, 1990;). In the next section there will be a discussion of the findings of the study.

Findings of the study

The QRI-4 pre/posttest results showed improvement in the areas of accuracy and

reading rate, for all three students. There were slight improvements in the area of

comprehension for two of the students.   Student A, who was a third grader, showed growth

in the area of accuracy for both the word lists and passages. He also improved his reading

rate on the first and fourth grade passages. His recall increased on the first and fourth

grade passages. His comprehension stayed at 100% for the first grade passage and

improved for the third and fourth grade passages. Student A's parent described him as not

being interested in reading and having a tendency to do as little school work as possible on

his own. During the intervention, Student A responded well to the one to one instruction

and especially enjoyed using the computer to make recordings of his reading and then

playing them back. He really got into the whole process when the researcher suggested he

imagine he was a radio announcer making a radio show.   Student A worked diligently on

making his recordings and was very interested in making each one sound better.

     Student B, who was in fourth grade, showed improvement in the area of accuracy for

both the word lists and passages. He was able to improve his reading rate on all the

passages. Student B maintained his recall and comprehension scores with a slight increase

for the second grade passage. Student B's parents described him as having attention

problems in school and were in the process of having him tested for Attention Deficit

Disorder.   In working with Student B, it was evident that he had a short attention span and

frequently needed refocusing. The one to one format helped him to stay focused, but it was

important to have the steps clearly listed on a card and the materials laid out ready to go to

support him in staying on task. Student B also enjoyed imagining he was making a "radio

recording" and worked to use the skills discussed in the lessons. While his reading rate and

accuracy did improve, his ability to concentrate may have affected his ability to retell and

answer the comprehension questions on the QRI-4.

   Student C, who was also in fourth grade, also showed improvement in the area of

accuracy on the word lists and passages, but continued to struggle with low reading rate on

all of the QRI-4 passages. He was able to show an increase in recall on the first and fourth

grade passages. Student C was referred to the study by his school's reading specialist for

difficulties with slow reading rate. His parents also mentioned that reading difficulties ran

in their family, but that he had never been diagnosed as having a learning disability. He

tended to slow himself down with lots of repetitions and decoding errors, but was able to

self-correct. While he did not show a gain from pretest to posttest in the area of

comprehension, he did maintain a 100% score on the first grade passages and 88% for the

other passages.   Student C was aware that his reading was slow and worked hard on trying

to improve.   He was the last student to join the study and started his intervention sessions

a bit later in the school year. Unfortunately, due to end of the year school activities, Student

C's sessions were spread out with more time in between sessions.   This may indicate the

importance of concentrating interventions sessions closer together over a shorter period of

time. Homan, Klesius, and Hite (1993) found that reading growth occurred as a result of

the students' focus on connected text reading for three 20-minute sessions over a seven-

week period. Martens et al. demonstrated that an intervention that combined fluency

building strategies with student self monitoring and rewards can effectively support

growth of up to two grade levels in three 30 minute sessions over a five week period.

The results for the *"Tell Me What You Like"* survey were only administered at the

beginning of the study to help the researcher get to know the students and to help in

selecting materials. Each student showed a variety of interests with all three indicating an

interest in computers. Lessons for the students were chosen based on their interests from

Increasing Fluency with High Frequency Word Phrases, Grade 3 (Knoblock, 2007) and *Read-*

Aloud Passages and Strategies to Model Fluency, Grades 3-4 (Mann, 2007). For example, one

lesson called, "A Glass of Milk" was about eating dairy foods. The fluency skill focused on in

the lesson was breaking up sentences into "chunks" or phrases. After completing the

lesson, the student was asked to read the passage as though it were a commercial for a

grocery store.   Another lesson was an excerpt from the story, "Charlotte's Web". The

students used this passage to practice reading dialogue and adding expression. All three

students appeared very motivated to read and practice the passages that were selected.

The Reader Self-Perception Scale (RSPS) was given to assess the students' perceptions of

themselves as readers before and after the intervention. There was no change in the

results of this assessment from pretest to posttest suggesting that the intervention did not

change the way the students perceived themselves as readers.

During the intervention, two students made two recordings each of 9 passages, and one

student made two recordings each of 8 passages. Student A gained an average of 11.2

words on his second recordings, Student B gained an average of 12.9 words on his second

recordings, and Student C gained an average of 9.6 words on his second recordings.

Throughout the intervention it was emphasized that good readers read at a rate they can

follow the meaning. It was emphasized that they learn to monitor the quality of their

reading over reading speed.   For example, during the reading of the "Charlotte's Web"

passage, the students had to follow the meaning of the passage to know where to add the

correct characterization.   Applegate, Applegate, and Modla (2009) found that it is

important to support the development of fluency and comprehension by providing

activities that stimulate thinking about the reading. The combination of repeated reading

and audio recording helped the students to listen to and critique their own reading. This in

turn helped them to focus on the meaning of the story and to figure out where to add the

voices of the characters.

   The student responses and teacher observations recorded during the intervention

provide evidence that the students were thinking about what they had learned from the

mini lessons and were trying to incorporate this learning into their computer recordings.

The process of setting up the computer and microphone, recording, listening, critiquing,

and then repeating the process a second time was fun and engaged the students. Asking

them to imagine they were making a radio show, allowing them to manipulate the

computer technology, and having them rate their recordings gave them an authentic

purpose for practicing their reading. With the addition of the researcher's feedback, the

students began to listen carefully to their readings and were able to articulate what would

help to make the next reading better.   Research has found that reading tasks that are

purposeful and relevant such as having students chart their own reading rate and having

students make their own recordings can keep students motivated and more engaged in

getting the practice required to reach instructional goals, (Homan, Klesius, & Hite, 1993;

Martens et al. 2007).

In summary, the QRI-4 results indicated reading growth for all three students in the

areas of accuracy and reading rate. Two of the students showed a slight improvement in

the retell and comprehension portions of the QRI-4. The results of the "Tell Me What You

Like" survey were given at pretest only and assisted in planning lessons that were

motivating for the students. The results of the RSPS did not indicate a change in the

student's self-perceptions of themselves as readers, however the computer audio

recordings, student's responses, and the researcher's observations provide evidence that

the students were thinking carefully about the fluency skills covered in the mini-lessons,

attempting to incorporate these skills into their repeated readings, and were

enthusiastically engaged in the process of audio recording their repeated readings. The

next section will continue with a discussion of the strengths of this study.

Strengths of this Study

One strength of this study was the finding that struggling students benefited from a carefully

designed intervention that combined multiple strategies to support fluency and comprehension

growth. It has been found in current research that struggling students benefit from one to one

support and supervision of oral reading practice to help them achieve necessary levels of fluency

(Conderman & Strobel, 2008; Vadasy, Sanders, & Peyton, 2005). Furthermore, a targeted

fluency program that is closely matched to students' instructional levels can produce

significant gains in oral reading fluency (Martens et al., 2007).

Another key finding was that students benefited from combining computer audio

recording with repeated readings. Teachers need to find ways to integrate the necessary

practice required to help students develop their fluency and comprehension abilities into

the busy school day. Macaruso and Rodman (2009) found that struggling students using

Computer Assisted Instructional programming could make significant gains when it was

appropriately implemented and utilized as a key part of reading instruction. Using

computer audio recording with the repeated readings was an appropriate way to help

students to practice the skills following the direct instruction they had received in the first

part of the session.   In addition, the computer audio recordings also had the advantage of

allowing the students to listen to their own readings and to evaluate their own

performance. Martens et al. demonstrated that combining fluency-building strategies with

student self-monitoring and rewards could effectively support reading growth.

In summary, this study supports the findings of other studies that struggling readers

benefit from interventions that combine multiple strategies to support fluency and

comprehension growth. In addition, the findings of this study also suggest that computer

audio recording of repeated readings is a motivating option for fluency practices with the

added benefit of helping students to self-monitor their own reading. The chapter will

continue with a discussion of the limitations of the study.

Limitations of this Study

Although the intervention was successful in helping the students achieve reading growth, there were some limitations to the study. One limitation was the small sample size of three students. Other limitations that may have affected the results were that the intervention was conducted after school, that it took place at a site separate from the school, and that it did not take place in the context of a typical school day. The intervention also took place in the last months of the school year when there were many special activities that took place after school, such as the spring music program and baseball practices. This resulted in only being able to meet with the individual students once a week for some of the sessions. Therefore, there was a lot of time between sessions where students may not have been able to retain what they had gained from the previous session.

Another limitation was the inexperience the researcher had in designing the steps to the intervention. With so much to get done, it was found that the student monitoring sheets that asked the students to record a reading goal and rate their reading on a scale of 1 – 4 were too complex and took too long to fill out. In addition, it was very difficult for the students to rate their own reading using the fluency scale. An improvement would have been something simpler, like having a checklist or having students respond to yes/no statements.

In summary, some limitations to consider for this study were that it had a small sample size of three students, the intervention did not take place in the context of a normal school day, and scheduling conflicts resulted in gaps of up to one week between sessions. There

were also difficulties found with the design of the student monitoring sheets that suggest a

more simplified version for future applications of this intervention. The chapter will

continue with some recommendations for future research.

Recommendations for Future Research

The focus of this study was to develop an afterschool intervention that supported

intermediate aged students in developing reading fluency. One of the challenges teachers

face in helping students who are deficient in reading fluency is motivating them to practice.

This study was successful in showing that computer audio recording of repeated readings

could successfully motivate students to practice their fluency skills. It is recommended that

future studies explore the advantages of integrating computer technology into the

practicing of fluency skills. Despite the documented success of the repeated reading

strategy, many struggling readers are unmotivated to read the same passage over and over.

In addition, repeated readings and other practices like partner reading and choral reading

require time for teachers to work individually with students or require extra time set aside

for students to work together. Setting up a fluency practice center that integrates

computer audio recording with repeated readings could offer the advantages of a more

efficient and motivating way of allowing students to self correct and monitor their own

reading.

An additional benefit of making the computer audio recordings was having a permanent

record of the students' fluency growth. This record proved to be useful for planning

individual lessons and tracking each student's progress throughout the intervention. More

research is needed to explore the benefits of using computer audio recordings as assessment tools for teachers in the monitoring of fluency growth.

More research is also needed to explore the possible benefits of other applications of computer audio recording such as podcasting.   Existing studies on integrating computer technology into the reading curriculum have shown that specific computer programs that focus on phonics and word identification skills can promote reading fluency for children at the elementary and middle school levels (Knezek & Christiansen, 2007; Lewandowski, Begeny, & Rogers, 2006; Macaruso & Rodman, 2009;). In addition, Savage et al. (2010) found that teachers who can expertly integrate and extend computer technology into the larger literacy curriculum support greater gains in overall reading achievement. Making classroom podcasts, where students are engaged in the process of making a recorded program where they present favorite book passages, poetry, reader's theater, or news articles would provide authentic opportunities for students to practice their oral reading skills. Students could be involved in all aspects of podcast production such as planning, writing scripts, and recording with finished podcasts being shared with the larger school community.

In summary, the findings of this study support the integration of computer applications like Garageband audio recording into a balanced reading curriculum. More research is needed to explore the advantages of using computer audio recording for such purposes as motivating struggling readers to practice fluency, to provide convenient assessment records for teachers, and to further extend oral reading into the larger reading curriculum

through the vehicle of classroom podcasts. The next section will continue with a

conclusion for the chapter.

Conclusion

Reading research has found that fluency is multidimensional and develops gradually

from the early grades on. Speece and Ritchey (2005) found that disparities in fluency

development are present as early as the end of first grade with at-risk

students performing at half the levels of not-at-risk students. Therefore is it very

important for teachers to support fluency development early on in the reading curriculum.

Fluency must be developed alongside comprehension using activities that help students to

critically think about their reading (Applegate, Applegate, & Modla, 2009). The findings of

this study concur with the findings of other studies that support the use of multiple

strategies like repeated reading, corrective feedback, and student monitoring to support

the development of fluency (Devault & Joseph, 2004; Homan, Klesius, & Hite, 1993;Martens

et al. 2007;Rasinski, 1990). This study also found that students benefited from using the

Apple application, GarageBand to make computer audio recordings of repeated readings.

Using the computer technology was motivating and helped to students to become more

aware of how to make their reading more fluent. While more research needs to be done

specifically on using computer audio recording to support student's fluency growth, other

studies using computer technology have found that students show greater overall gains

when teachers expertly integrate computer technology into the reading curriculum to

support the areas of weakness (Knezek & Christensen, 2007; Lewandowski, Begeny, &

Rogers, 2006; Macaruso & Rodman, 2009; Savage et al., 2010).   In this study, computer

technology was specifically used to assist students in the practice of newly learned fluency

skills and to promote awareness of fluent reading. This integration targeted the students'

areas of weakness and was found to be successful in helping them to achieve reading

growth. Combining explicit fluency instruction with Garageband audio recording of

repeated readings is recommended as an efficient option for building reading fluency.

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