COMPREHENSION AND MOTIVATION LEVELS IN CONJUNCTION WITH THE USE OF EBOOKS WITH AUDIO: A QUASI-EXPERIMENTAL STUDY OF POST-SECONDARY REMEDIAL READING STUDENTS

by

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Liberty University

A Dissertation Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Education

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ABSTRACT

This quasi-experimental pretest, posttest nonequivalent control group study investigated the comprehension scores and motivation levels of post-secondary remedial reading students in a two-year technical college in Northwest Georgia using an eBook, an eBook with audio, and a print book. After reading a module on Purpose and Tone in the three book formats, data was collected from a convenience sample of 67 participants. Data consisted of reading comprehension scores taken from a pretest and posttest and reading motivation scores taken from a pre-survey and post-survey. The pretest and pre-survey were not used as covariates in the final analyses as they were not found to significantly influence the variables in the study. A one-way ANOVA was conducted on reading comprehension posttest results and indicated no statistically significant difference among book format groups. A MANOVA was conducted on reading motivation post-survey results. Pillai’s Trace was used to assess for equality of group means, a significant difference was found between groups on combined dependent variables. Univariate ANOVAs were run on each dependent variable and tested at an adjusted level of .025. Using the adjusted alpha level, none of the univariate ANOVAs reached significance. This study indicates using eBooks with audio in the college classroom may assist professors and students in providing an alternate method for delivering information and thus impacting reading comprehension, reading motivation, and college completion.

Keywords: audio, comprehension, eBooks, motivation, multimedia, remedial, reading, learning support
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# Table of Contents

Acknowledgements ........................................................................................................... ii

List of Tables .................................................................................................................... viii

List of Figures .................................................................................................................... ix

ABBREVIATIONS .............................................................................................................. x

CHAPTER ONE: INTRODUCTION ......................................................................................... 1

  Background ...................................................................................................................... 2

  Theoretical Framework .................................................................................................... 7

    Cognitive Theory of Multimedia Learning .................................................................... 7

    Self-determination theory ............................................................................................ 9

  Problem Statement ......................................................................................................... 10

  Purpose Statement ......................................................................................................... 11

  Significance of the Study ............................................................................................... 13

  Research Questions ....................................................................................................... 14

  Research Hypotheses/Null Hypotheses ......................................................................... 14

  Identification of Variables ............................................................................................. 15

  Definitions ...................................................................................................................... 18

CHAPTER TWO: REVIEW OF THE LITERATURE ............................................................... 20

  Introduction .................................................................................................................... 20

  Theoretical Framework .................................................................................................. 20
Question One ........................................................................................................................................ 71
Descriptive Statistics for Pretest Scores ......................................................................................... 71
Assumption Testing for Pretest Scores .......................................................................................... 72
Inferential Statistics for Pretest Scores .......................................................................................... 73
Descriptive Statistics for Posttest Scores ...................................................................................... 73
Assumption Testing for Posttest Scores ........................................................................................ 74
Inferential Statistics for Posttest Scores ......................................................................................... 75
Question Two .................................................................................................................................... 75
Descriptive Statistics for Pre-survey Scores ................................................................................ 75
Assumption Testing for Pre-survey Scores .................................................................................. 76
Descriptive Statistics for Post-survey Scores ............................................................................... 78
Assumption Testing for Post-survey Scores ................................................................................ 79
Summary ........................................................................................................................................ 83
CHAPTER FIVE: DISCUSSION ........................................................................................................ 85
Introduction ..................................................................................................................................... 85
Review of Methodology ................................................................................................................ 85
Relationship to Prior Research ...................................................................................................... 88
Theoretical Implications ................................................................................................................ 91
Practical Implications .................................................................................................................... 93
Limitations ....................................................................................................................................... 94
Recommendations for Future Research .................................................................96

Summary and Conclusions .................................................................................98

REFERENCES ......................................................................................................100

APPENDICES .....................................................................................................114
List of Tables

Table 1: Research Theorists.................................................................39
Table 2: Research Process Map.............................................................77
Table 3: Descriptive Statistics for Reading Comprehension Pretest Scores........80
Table 4: Descriptive Statistics for Reading Comprehension Posttest Scores.........81
Table 5: Descriptive Statistics for SRQ-L Pre-Survey Scores..........................83
Table 6: Descriptive Statistics for SRQ-L Post-Survey Scores...........................86
List of Figures

Figure 1: Depiction of how the Cognitive Theory of Multimedia Learning works......20
Figure 2: Diagram of pretest, posttest design......................................................60
Figure 3: Screenshot of the Overview of Purpose and Tone..................................66
Figure 4: Screenshot of the Model of Purpose and Tone.......................................66
Figure 5: Screenshot of the Animation of Purpose and Tone..............................67
Figure 6: Screenshot of reading comprehension test over Purpose and Tone...........67
Figure 7: Timeline of testing procedures..........................................................73
ABBREVIATIONS

ACT Compass - Computer Adaptive Placement Assessment and Support System
CTML – Cognitive Theory of Multimedia Learning
LWR – Listening-While-Reading
MRQ – Motivation of Reading Question
SDT – Self-Determination Theory
SRQ-L – Learning-Self-Regulation Questionnaire
UDL – Universal Design for Learning
CHAPTER ONE: INTRODUCTION

Through the ages, civilization has witnessed books evolve from words written on clay tablets and parchment paper to books printed from ink and more recently the amelioration of electronic books (eBooks). Many studies have sought to find the influence eBooks have on reading comprehension and motivation in elementary and middle-school students, and many have pursued the effect of supplemental audio engagement on the understanding of reading (Whiting & Granoff, 2010; Korat & Shamir, 2007; Zucker, Moody, & McKenna, 2009). Few studies have recognized the importance of how eBooks may affect reading comprehension in the post-secondary remedial reading setting, as well as their effect on motivation levels (Gonzalez, 2010).

Originally, eBooks consisted of a simple electronic version of a printed textbook (Rawlins, 1993). However, current eBooks come equipped with different modes of multimedia, including animation, audio narration, music, and sound effects. Some research suggests that audio-assisted narration such as Listening-While-Reading (LWR) has a small effect on student comprehension (Zucker, Moody, & McKinna, 2009). However, current literature suggests that much uncertainty still exists and research must continue (Schmitt, Hale, McCallum, & Mauck, 2011).

Based on the most recent studies available, further research needs to be conducted to determine if college remedial reading students show an increase in reading comprehension scores and motivation levels when reading from an eBook, an eBook with audio, or from a print book. One of the few studies which used all three book formats was conducted by Grimshaw, Dungworth, McKnight, and Morris (2007) who explored
student comprehension scores in elementary students. Using the three book formats of eBooks, eBooks with audio, and print books, the study’s participants were asked to read children storybooks in the format of both a printed version and eBook version. Of the eBook version, audio narration was used alongside the electronic text. The study found that the children equally liked reading the storybooks in print, eBook, and eBook with narration format. In addition, the research revealed that reading comprehension scores were essentially the same across all three formats, although those children using audio narration within the eBook format showed increased comprehension scores. Similar to the Grimshaw, Dungworth, McKnight, and Morris (2007) study, this quasi-experimental pretest, posttest nonequivalent control group study investigated the difference in reading comprehension scores and motivation levels of those post-secondary remedial reading students reading from an eBook, an eBook with audio, and a print book.

Chapter one provides an overview of the study. It also provides a background for the research, including the historical, social, and theoretical perspective of the study. Chapter one further explains the problem of the study, the significance of the study, as well as its relevance to research. This chapter introduces literature related to the problem, identifies the variables, and introduces the research questions and hypotheses.

Background

As current economic times have indicated, adults applying for work require at least some college education in order to obtain employment (Marschall, & Davis, 2012). According to the Georgetown University Center on Education and the Workforce, the United States will need 22 million new college degrees granted by the year 2018. This number will fall short by 3 million post-secondary degrees and would mean that
institutions would need to increase the number of degrees conferred by 10% each year (Carnavale, Smith, & Strohl, 2010). Ensuring success for these post-secondary students strongly depends on their ability to read and comprehend college textbooks, as well as their level of motivation for reading (Parker, 2012). As first-year students enter post-secondary institutions, many are placed into remedial reading courses based on scores from standardized college placement tests (Burdman, 2012). These students may be traditional or non-traditional and may come from varied backgrounds in relation to their reading comprehension abilities and motivation levels. Evidence has shown that rates of remediation placement are remarkably higher in two-year colleges (Calcagno & Long, 2009). In numerous two-year institutions, as many as 60% of recent high school graduates and 42% of all incoming freshman are placed into remedial classes (Burdman, 2013). Therefore, it is vital that post-secondary educators do all that is possible to enhance a remedial reading student’s comprehension and motivation levels in order to increase students’ chances of completing college (Perin, Bork, Peverly, Mason, & Vaselewski, 2011).

Central to reading comprehension and motivation, the model suggested by Guthrie, McGough, and Wigfield (2006) implies that motivation influences reading comprehension growth. Byrd and McDonald’s (2005) study discovered through surveys that college students placed into remedial classes declared that reading and English were their trouble areas even above math. Motivation, goals, and attitudes were thought to be a contributing factor in college students being underprepared and placed into remedial reading. Students in the study expressed the one area where they felt ill-equipped was reading, which further contributed to their low level of motivation.
Enriching reading comprehension and motivation levels of those placed in a developmental reading course may require educators to seek an alternate approach to teaching, such as including multimedia in the curriculum in order to improve a student’s reading comprehension and motivation level (Rodrigues & Martins, 2008). Multimedia may be described as using a combination of audio, text, video, animation, or graphics to display information (Reed, 2006). Gradually adding multimedia into the classroom has begun to supply an opulent learning environment for students by presenting information in varied constructs (Reed, 2006). Present research shows that using the Universal Design for Learning (UDL) as an instructional approach with struggling students provides the varied constructs needed to add a multimedia-rich learning environment which includes eBooks (Coyne, Pisha, Dalton, Zeph, & Cook-Smith, 2010).

Today’s post-secondary student is considered to be multimedia savvy and students enjoy using components of audio for communication, education, and entertainment (Edirisingha, Hawkridge, & Fothergill, 2010). Adding the multimedia component of audio to a remedial reading course is one facet that might be used by educators to ensure student reading comprehension success and raise student motivation. This may be accomplished by offering the audio element through textbooks. Peters (2009) discovered that today’s reader finds that adding an audio element to a book actually supplements the reader’s visual reading habits. Similarly, a recent study among elementary students with and without reading disabilities discovered that students with reading weaknesses scored higher on audio tests versus standard paper tests (Laitusis, 2010). Therefore, adopting electronic textbooks with an audio component may assist remedial reading teachers in the classroom.
Today’s textbook is much more than written words and pictures. Today’s textbook can be found in printed or electronic form. EBooks may include the technologies of audio, motion pictures, and other interactive features. The eBook is very easy to access, it’s inexpensive, and interactive, and according to Rawlins (1993), the eBook will “change the way we think” (p. 478). The eBook has evolved over the years by adding such features as audio narration, the ability to control text font, the ability to highlight text, and saving notes (Cavanaugh, 2002). These are just a few of the added features of today’s eBook. With its present digital capabilities, the eBook is a unique option for college professors as an alternative to traditional print books. Adding the audio component to eBooks may ensure success for struggling readers or readers who lack self-confidence (Oakley & Jay, 2008).

On July 21, 2011, the Department of Education presented to employees and other dignitaries President Barack Obama’s 2020 College Completion Goal (Kanter, Ochoa, Nassif, & Chong, 2011). This address illustrated the importance of obtaining a college degree in today’s society in relation to the declining graduation rate among post-secondary students. In addition to presenting a college completion agenda, the presentation called for the need of post-secondary educators to assist in increasing college graduation rates through Complete College America. The presentation confirmed that 38% of all college freshmen will take a remedial course and the success of students in these remedial college courses will play a large role in boosting graduation rates. According to Georgetown University, Center on Education and the Workforce, (2010), boosting graduation rates is very important as 62% of all jobs will require some post-secondary education by the year 2018.
Therefore, college professors teaching developmental reading courses must provide a learning atmosphere which assists remedial students in successfully completing their college degree through researched best practices and new and innovative ideas (Parker, 2012). This may be accomplished by supplementing teaching with technology or multimedia, such as eBooks.

When considering the use of eBooks, the thought of higher education without a printed textbook would have been unimaginable ten years ago (Rose, 2011). Yet, today digitized texts are commonplace and many empirical studies have been conducted on their value (Cavanaugh, 2002, Fister, 2010, Martinez-Estrada, & Conaway, 2012). However, through his research, Wells (2012) concludes that a significant gap in literature related to eBooks and their effect on reading comprehension and motivation in college students still exists. He further explains that in addition to the limited amount of studies using college students these studies only measured usability in post-secondary students and not comprehension. Therefore, the impact eBooks and eBooks with audio will have on undergraduate remedial reading students in reading comprehension and motivation compared to print books is not yet clear. It is necessary to study the impact of students using an eBook separately from students using an eBook with audio, as eBooks with audio combine two modes of learning through visual (digital text) and audio input (audio narration). According to Paivio’s (1986) Dual-Code Theory, using two modes of learning increases students’ comprehension. For this reason, comparing these two book formats separately, along with print books, is vital to this study.
Theoretical Framework

Cognitive Theory of Multimedia Learning

This quasi-experimental pretest, posttest nonequivalent control group study sought to examine the reading comprehension scores and motivation levels of post-secondary remedial reading students using eBooks, eBooks with audio, and print books. Mayer’s (2005) Cognitive Theory of Multimedia Learning (CTML) helps to ground the concept of using multimedia, such as eBooks with audio, to assist remedial reading students. The foundation for understanding Mayer’s (2005) theory is based upon enhancing student learning through visual and auditory technology. Moreno and Valdez (2005) explained that when instructional material was presented in two representation codes the result was higher performance. The two representation codes may come in the form of words and sounds, or they may come in the form of images and sound. Research has shown that using two codes simultaneously provides a relatively low cognitive load. This process has been identified by Paivio (1986) as the Dual-Code Theory. Paivio (1986) asserted that people perceive non-verbal and verbal codes through their eyes and their ears. Paivio (1986) showed that when these two codes were presented together through images and narration, then increased learning would take place. However, Sweller’s (1999) Cognitive Load Theory warned that using multiple modes of representation such as visual and audio may create a cognitive overload, and information must be presented in a way in which split attention does not occur between the two codes.

According to Mayer and Moreno (2003), meaningful learning occurs when a student uses a variety of their cognitive processes in order to comprehend presented information. Mayer's theory is important to reading research as he felt "reading is an
intriguingly complex cognitive activity" (Mayer, 2005, p. 355). Muller-Kalthoff and Moller (2006) explained that Mayer’s research proved that teaching and learning materials which were well-designed were of more benefit to students possessing low prior knowledge than those with higher prior knowledge. Remedial reading students tend to display low prior knowledge. Mayer (2005) purported that information presented together, such as text with audio or graphics with audio, provided a deeper learning for students than text alone.

According to Mayer (2005), when an eBook produces narrations, the student hears the spoken words and temporarily holds the words in their auditory sensory memory. Next, active cognitive processing takes place by the student transferring the words heard into meaning. Students do this by using prior knowledge connecting words with an image. Mayer’s (2005) CTML is illustrated below in Figure 1.

![Cognitive theory of multimedia learning](image)

*Figure 1.* Depiction of How the Cognitive Theory of Multimedia Learning works.
Mayer’s (2005) CTML, as applied to this study, used the independent variables of eBooks and eBooks with audio to determine if this format of book had an influence on reading comprehension scores in post-secondary remedial reading students compared to students using traditional print books. According to the CTML, the brain uses two separate channels of visual and audio input to process information (Mayer, 2005). These channels were used to process information found in the three book formats of eBooks, eBooks with audio, and print books used in this study. They may be applied alone with the visual channel used to process digital text in an eBook or printed text in a print book. In the case of this study, they were used together with the visual and audio channels employed to process an eBook with audio.

**Self-determination theory**

Ryan and Deci’s (2000) Self-Determination Theory (SDT) relates student motivation to belongingness and connectedness. They go further in explaining their theory by using the comparison of a student completing their homework because of parental pressure and low autonomy to completing their homework because they realize that the homework may assist them in future goals. This type of motivation is considered a personal demonstration from the student. SDT indicates that the more self-determined a student is the more likely they are to gain knowledge through this motivation. If students are to boost their self-determined motivation, educators must follow the principles of SDT in order to account for students’ psychological needs. These needs include: competence (C), autonomy (A), and relatedness (R) (Komiyama, 2009). These needs are referred to as CAR. Komiyama (2009) recognizes that with the use of the CAR principles teachers may successfully cultivate a more self-determined reader who relies
less on grades and more on motivation. In relation to reading, Ryan and Deci (2000) feel that when children are young they are more susceptible to intrinsic motivation and will actually pursue reading. However, as children become older they tend to lose the intrinsic motivation to read due to classroom environments and the absence of fostering motivation by educators.

As many struggling readers often lack the motivation to read (Guthrie & Davis, 2003), this study investigated the use of eBooks and eBooks with audio to determine if this type of multimedia had an effect on post-secondary students’ reading motivation compared to the use of print books. Studies have shown that motivation has an effect on reading comprehension. A recent study revealed that the use of multimedia and online storybook reading may have a positive effect on motivation. This was found particularly true among students who were unsuccessful in reading (Ciampa, 2012). Therefore, exploring student motivation and reading comprehension was a vital process within this study. This study used Mayer’s (2005) CTML as its main theory in conjunction with the Dual-Code and Cognitive Load Theories. In addition, the Self-Determination Theory was used to examine what drives motivation in post-secondary remedial reading students.

**Problem Statement**

The problem concentrated upon in this research was the absence of significant studies addressing comprehension and motivation levels in post-secondary remedial reading students using eBooks and eBooks with audio compared to students using print books. As comprehension and motivation are the foundation for success in post-secondary remedial reading students, it is valuable to uncover meaningful approaches to promote understanding. As this study involved the use of multimedia in eBooks, Mayer’s
(2005) CTML was used as a guide in this study. Mayer’s (2005) theory suggests that meaningful discovery occurs when information is presented in multiple representations, such as audio narration and video (Moreno & Valdez, 2005). Mayer (2011) confirms that multimedia research is important, as textbooks continue to transfer from print-based books to eBooks. Through eBooks, students are being exposed to multimedia games, audio narration, simulations in the classroom, and a variety of hand-held technologies. Therefore, it is important to research the most effective ways to design multimedia instruction. A previous study reported that listening comprehension and decoding have made independent contributions to reading comprehension (Macaruso & Shakweiler, 2010). Therefore, investigating the impact of eBooks with audio and listening comprehension was an important aspect of this research.

Using the CTML alongside Ryan and Deci’s (2000) Self-determination Theory, this quasi-experimental pretest, posttest nonequivalent control group study sought to investigate college remedial reading students’ comprehension scores and motivation levels when reading from an eBook, an eBook with audio, and from a print book. Participants in the study included post-secondary remedial reading students enrolled in a two-year technical college in Northwest Georgia.

**Purpose Statement**

The purpose of this quasi-experimental pretest, posttest nonequivalent control group study was to use Mayer’s (2005) Cognitive Theory of Multimedia Learning (CTML) to investigate the effect of comprehension scores in post-secondary remedial reading students using an eBook, an eBook with audio, and a print book. Alongside the CTML, this study used Paivio’s (1986) Dual-Code Theory and Sweller’s (1999)
Cognitive Load Theory to investigate the use of multimedia in the research. This study also used Ryan and Deci’s (2000) Self-determination Theory to assist with the examination of motivation in post-secondary remedial reading students using an eBook, eBook with audio, and print book.

Research using eBooks and eBooks with audio must be conducted to determine which settings and under which conditions reading comprehension and reading motivation may be affected. The independent variable in this study was identified as book format. The independent variable had three levels which included eBooks, eBooks with audio, and print books. The dependent variables included reading comprehension scores and reading motivation levels.

This study sought to develop an understanding of how the usage of eBooks, eBooks with audio, and print books affected reading comprehension scores and motivation levels in post-secondary remedial reading students. Thirty-eight percent of all freshman college students will be placed into remedial reading, and few of those students will obtain a degree (Kanter, Ochoa, Nassif, & Chong, 2011). Remediation further extends a college student’s time in college and may affect their degree persistence and eventual graduation (Bettinger & Long, 2009). College professors must find a way to assist remedial reading students with comprehension and motivation levels in hopes to boost graduation rates. This study examined if adding the multimedia of eBooks and eBooks with audio into the college classroom assisted remedial reading students in finding success in reading comprehension and reading motivation.
Significance of the Study

According to a 2010 report entitled *Help Wanted: Projecting Jobs 2018*, Parker (2012) asserts that by the year 2018, 22 million new workers with postsecondary degrees will be needed in the workforce. At the current graduation rate of college students, this goal will fall short by three million workers unless a change in educational practices occurs. Recent developments in lower graduation rates in public colleges have heightened the need for post-secondary institutions to rely on technology-based learning to promote student understanding (Aud, et al, 2013). Included in this technology is the rising interest in eBooks. College libraries have recently begun to catalog eBooks and online journals within their systems (Rose, 2011). College professors are using eBooks for texts and online PDF files for classroom literature. This study was important to post-secondary institutions as this mode of learning is ever-increasing, especially with developmental learning students.

In addition to investigating reading comprehension as it related to eBooks, there was the question of self-confidence levels among college students. According to Lei, Bartlett, Gorney, and Herschbach (2010), students frequently are not inclined to read because of minimal motivation resulting from a lack of confidence. Therefore, instructors must also seek to improve reading compliance and motivation by increasing confidence levels of students.
Research Questions

This quasi-experimental pretest, posttest nonequivalent control group study was motivated by the following research questions:

RQ1: Is there a statistically significant difference in the reading comprehension scores of those post-secondary remedial reading students using an eBook and an eBook with audio compared to students using a print book controlling for the pretest, while controlling for the pretest?

RQ2: Is there a statistically significant difference in the motivation levels of those post-secondary remedial reading students using an eBook and an eBook with audio compared to students using a print book, while controlling for the pre-survey?

Research Hypotheses/Null Hypotheses

The following were the research hypotheses in null form:

H1: College remedial reading students using an eBook, eBook with audio, and a print book will display statistically significant differences in reading comprehension scores, as measured using a reading comprehension test, while controlling for the pretest.

H0: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in reading comprehension scores, as measured using a reading comprehension test, while controlling for the pretest.

H2: College remedial reading students using an eBook, eBook with audio, and a print book will display statistically significant differences in their mean scores for the linear combination of the reading motivation scales as measured using the Learning Self-regulation Questionnaire, while controlling for the pre-survey.
**H₀₂**: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the linear combination of the reading motivation scales as measured using the Learning Self-regulation Questionnaire, while controlling for the pre-survey.

**H₀₂.₁**: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the autonomous motivation scale as measured using the Learning Self-regulation Questionnaire, while controlling for the pre-survey.

**H₀₂.₂**: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the controlled motivation scale as measured using the Learning Self-Regulation Questionnaire, while controlling for the pre-survey.

**Identification of Variables**

The independent variable for both research questions was book format. There were three levels of the independent variable: (1) print book format, (2) eBook format, and (3) eBook with audio format. The dependent variable for research question one was reading comprehension as measured by a comprehension test found in Pearson’s MyReadingLab™ over Purpose and Tone (Appendix C). The dependent variable for research question two was a reading motivation survey identified as the Learning Self-Regulation Questionnaire (SRQ-L) (Black & Deci, 2000).

The independent variable for question one identified in this study was book format. Book format included an eBook, an eBook with audio, and a print book. The eBook was defined as digital text found in a module over Purpose and Tone located
within Pearson’s MyReadingLab™. MyReadingLab™ is an online program which uses Knewton’s Adaptive Learning System software to individualize student learning paths in remedial reading, math, and English classrooms. In its beginnings, Knewton used Arizona State University as a testing ground for its software. According to a Forbes magazine article and the website Inside Higher Education, Arizona State University saw its students accelerate through remedial classes using Knewton’s adaptive system (Kolowich, 2013; Upbin, 2012). Therefore, MyReadingLab™ has proven itself in advancing reading skills through remediation across four levels of difficulty. It offers struggling college readers the opportunity to practice and master basic reading skills across 26 skill topics located in modules.

The eBook used in this study was defined as a module found in MyReadingLab™ over Purpose and Tone. The module consisted of a two-page, 388 word overview over Purpose and Tone, a five-page, 1,217 word model of Purpose and Tone, and an eight-slide presentation over Purpose and Tone that were viewed as digital text. The eBook with audio was defined as a duplicate of the eBook. However, the only difference in the eBook with audio was the accompaniment of a narrated audio recording of the digital text which was accessed by the student through the use of headphones. The print book was text identical to the eBook, although provided in printed paper only.

The dependent variable identified in question one was identified as a comprehension test found in Pearson’s MyReadingLab™. The test consisted of 10 multiple choice questions related to a reading passage over Purpose and Tone (Appendix C). The test was administered as a pretest and a posttest. Although the module was read
by participants in eBook, eBook with audio, and print formats, students were given the reading comprehension pretest and posttest electronically through MyReadingLab™.

The dependent variable for question two was identified as reading motivation level which was measured using a pre and post-survey developed by Black and Deci (2000) entitled Learning Self-Regulation Questionnaire (SQR-L) found. The survey contained two sections entitled “Learning” and “Reasons for Learning.” There were two subscales in each section measuring a student’s autonomous and controlled motivation. A total of 26 questions related to a student’s motivation to read were answered using a paper and pencil survey. Each section was divided into three groups of items and they were rated using a scale of 1 to 7. Scores for each subscale in each section were manually graded by the researcher.

According to Campbell and Stanley (1963), the pretest, posttest non-equivalent control group design was best to use for this study as participants were not randomly selected. The evaluation of this research placed participants into two non-random groups: control and experimental. Students in the control group read from a traditional print book, and students in the experimental group read from either an eBook or eBook with audio. A baseline for evaluating the equality of participants’ knowledge of the instrument was measured using a pretest. Once students were exposed to their treatment, a posttest was administered. Any significant difference reported between the pretest and posttest was attributed to the treatment. Likewise, students were given the Learning Self-Regulation Questionnaire (SRQ-L) as a pre-survey to assess reading motivation and were given the same questionnaire as a post-survey to compare the difference between the two.
Definitions

The following definitions are furnished to insure these terms are understood throughout the study.

**Cognitive Load Theory** – a theory which addresses the limitations of working memory based on cognitive understanding (Mayer, 2005).

**Cognitive Theory of Multimedia Learning** - the processes of using one’s auditory/verbal channel and a visual/pictorial channel for processing multimedia materials and how they are processed into working memory (Schuler, Scheiter, & van Genuchten, 2011).

**Dual-Code Theory** – information is processed by two channels; the audio (sound) and visual channel (text, images, pictures, animation) (Paivio, 1986).

**eBook** – or electronic text. The eBook consists of an eBook file, software to read the eBook, and a hardware device such as a mobile device, laptop, or personal computer to read the book (Cavanaugh, 2002). Text is shown in digitized form and presented on computers or other digital devices such as the iPad, Kindle, Nook, or a computer screen.

**Learning-centered approach** - an approach to instructional design that focuses on using multimedia technology as an aid to human cognition and based on the premise that multimedia designs that are consistent with the way the human mind works are more effective in fostering learning than those which are not (Mayer, 2005).
Listening-While-Reading (LWR) - LWR may be referred to as listening previewing and involves a student reading silently while identical text is read aloud by a live person or a technological device (Schmitt, Hale, McCallum, & Mauck, 2010).

Multimedia - text, sound, graphics, animation, video, imaging, or spatial modeling included in information (Dolittle, 2002).

Remedial - coursework which is below level. Also known as developmental education, it refers to a lack of preparedness in a particular content area where one must be remediated or retaught (Parker, 2012).

Technology-centered approach - an approach to instructional design that focuses on how to incorporate emerging technologies into instruction and on which technology is most effective in presenting information (Mayer, 2005).

Universal Design of Learning (UDL) - UDL is a structure for teaching and learning that takes advantage of modern technologies in order to focus upon the needs of the largest possible range of students (Rose & Gravel, 2010).

Chapter 2 provides a literature review of the theoretical framework of this study and its relevance to the variables of reading comprehension and reading motivation. Chapter 2 follows the history of research conducted regarding remediation, comprehension, motivation, eBooks, and eBooks with audio. Chapter 3 describes the research design, research questions and hypotheses, participants, setting, instrumentation, procedures, and data analysis.
CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

The literature review for this study investigated several dominant themes within the research: eBooks, audio narration, reading comprehension, and motivation. This chapter explains how these variables are linked. Mayer’s (1998) Cognitive Theory of Multimedia Learning (CTML) was the mainstay of this research and sought to connect the use of eBooks, eBooks with audio, and print books to a difference in reading comprehension scores and motivational levels among post-secondary remedial reading students. In addition, Ryan and Deci’s (2009) Self-Determination Theory examined motivation in post-secondary remedial reading students.

The research included in this literature review is represented from the disciplines of education and educational psychology. The research was taken from journal articles, reports, and dissertations using the keywords eBook, electronic book, audio, multimedia, reading, comprehension, and motivation. The majority of research was found in the databases of ERIC, ERIC (EBSCOhost), Liberty University’s Digital Commons, and Pro-Quest Dissertations and Theses.

Theoretical Framework

Comprehension

Multimedia Theory. According to Mayer’s (2000) Cognitive Theory of Multimedia Learning (CTML), there are visual and verbal models of mental representation (Mayer & Anderson, 1991). The CTML presumes that when learners are presented information encoded both verbally and visually they remember and transfer information more effectively (Mayer & Anderson, 1991). The rationale for this theory
further explains that when a learner is delivered information in two modes (visual and audio) at the same time it’s as if the learner is receiving the material twice (Mayer & Moreno, 2003).

At first glance, this recommendation may sound like nothing more than common sense. One may argue that the best strategy should be inserting audio narration whenever possible, as suggested by Clark and Mayer (2003), because multimedia has been shown to improve learning in novice students who have low levels of knowledge in their content areas. As Paivio’s (1986) Dual-Code Theory is a mainstay for CTML and professes that using two representations (visual and audio) at once is ideal for increased learning, it would be presumed that two representations are better than one. However, Sweller’s (1986) Cognitive Load Theory suggests that using multiple representations may actually cause a cognitive overload in students.

**Dual-Code Theory.** Paivio’s (1986) Dual-Code Theory is based upon presenting information in two representation codes: audio or verbal and visual. Mayer and Anderson (1991) conducted a study among college students which supported the pronouncement that corresponding presentation of speech and animation gives rise to better problem-solving among students. The study performed two experiments using college students from a California university. Participants were described as having limited knowledge of their subject (the operation of a bicycle tire pump). In the first experiment, students were divided into two groups. One group viewed an animation illustrating the process of a bicycle tire pump while providing a corresponding verbal description during the animation of the procedure (words-with-pictures). The second group viewed a description of the process before the animation was shown (words-before-pictures). After viewing
the animation three times, students were given a problem solving questionnaire. Results of the questionnaire were analyzed and showed the words-with-pictures group performed better in problem solving than the words-before-pictures group.

A second experiment containing two parts was conducted using the same participant pool as the first experiment. In the first part of the second experiment, students were again asked to view the animation in their two groups and were again asked to take the problem solving questionnaire. However, this time the questionnaire was followed by a recall test. Results of the problem solving questionnaire again showed the words-with-pictures group performed better in problem solving skills. However, the recall experiment provided different results. The recall test asked students to name the steps involved in the procedure for using a bicycle tire pump and results of the recall test showed equal understanding among the two groups. Mayer and Anderson (1991) felt this was due to presenting the information in two representations codes (audio and visual), whether presented together or separately. The second part of the second experiment used students from the same participant pool, but this time used three experimental groups and one control group: animation with words (words-with-pictures), animation without words (pictures only), heard the words without the animation (words only), and no training (control). The same problem solving questionnaire was given following the treatment. Results showed the words-with-pictures group outperformed the other experimental groups and the control group. Implications of this research further advanced the use of dual representations by using words with animation, where much of the previous research had only used static images in their studies (Mayer & Gallini, 1990). This research is important as it was conducted using post-secondary students who were limited in their
knowledge much like remedial reading students. It supported a dual-code approach to learning which provided educators with the knowledge that two representations were better than one.

However, there are incidences where audio narration would not be suggested. The cognitive load theory shows that when graphics are accompanied by text and audio narration, an overload may occur. The reader is producing through the verbal channel, but the visual channel becomes overloaded with text and graphics. In essence, the learner cannot view two items at once (visual channel), while also processing it through their auditory channel. This is also considered to be redundant on-screen text or redundancy and has been shown in previous research by Kalyuga, Chandler, and Sweller (1999). This redundancy supports Sweller’s (1994) Cognitive Load Theory by showing that use of more than two representation codes together decreases students’ comprehension.

**Cognitive Load Theory.** Sweller’s (1994) Cognitive Load Theory states delivering information to students through multiple modalities may actually cause a cognitive overload. While Mayer (2005) agreed with the Cognitive Load theory, he argued that information is processed through audio and verbal channels and when presently simultaneously can increase knowledge without cognitive overload if presented in the correct manner.

Liu and Chang (2011) conducted a quasi-experimental study among 262 middle school students in Taiwan. Students were separated into eight classes, with four groups being assigned to a rich media group receiving information through both pictures (visual) and verbal narrative (audio) and four groups being assigned to a simple media group receiving information only through their visual channel. Information on oxidation-
reduction was delivered to the students in their assigned modality. The rich media group watched a simulation of oxidation-reduction with an audio verbal explanation in narrative form and the simple media form watched the same simulation with on-screen text as the verbal explanation. After viewing the simulation, students were tested on prior knowledge, achievement, and cognitive load. Prior knowledge and achievement were tested by multiple choice questions and cognitive load was measured using a self-reported rating of how much effort the student invested in learning the assignment. Results showed that students who received the audio narrative explanation along with the simulation showed improvement in testing when compared to those students who received the simulation and on-screen text. The explanation for this improvement suggested that adding the verbal explanation in auditory form actually reduced the cognitive load. This research was important as it solidified the need for educators to be aware of the cognitive load process when injecting multimedia into classroom instruction. Recognizing the cognitive load process was important to this research as this study used only audio and text together and did not attempt to overload the students.

Understanding the use of audio and cognitive load was an important aspect of this research. Not only was it vital to realize how the use of multimedia effects a student’s cognitive load, but it was equally important to understand the different aspects of this multimedia and how sensitive its addition could be to reading comprehension and motivation. Pastore (2010) found in his research that the speed in which audio is injected into information can also have a bearing on cognitive load and a student’s ability to comprehend. Pastore (2009) conducted research in which he introduced 216 post-secondary students into a multimedia environment. Instruments used in the study were a
A diagram of the anatomy of the heart with audio narration and an audio narration of the heart with no visual diagram. There were three voice speeds used in the audio narration; 0% - normal speed, 25% - slight increase in speed, and 50% - increased speed. Students were divided into six treatment groups: audio with no visual/audio speed of 0%, audio with no visual/audio speed 25%, audio with no visual/audio speed of 50%, audio and visual/audio 0%, audio and visual/audio speed 25%, and audio and visual/audio speed 50%. After receiving their treatment, students were given four achievement tests consisting of drawing the heart, identification of anatomy, terminology of the heart, and comprehension. The results of the study confirmed Mayer’s (2005) CTML by revealing that students in the study outperformed other students when presented with multiple media representations. Students receiving the audio and visual representation of the heart outperformed their counterparts. In addition, it was equally important to note that students who were delivered the audio narration at a 0% or 25% speed showed no increase in their cognitive load and outperformed those students receiving audio narration at a 50% speed. Implications of this research suggested that not only was it best to deliver information in both visual and auditory channels together, but when designing multimedia for classroom instruction educators must be aware of the sensitive nature of adding audio.

Although increased cognitive load is a concern in using multimedia during instruction or research, for the purposes of this study, the eBook with audio was presented as on-screen text accompanied by audio narration and should not have had an effect on students’ cognitive load. In this case, according to Clark and Mayer (2003), the spoken words entered through the audio channel, and the text entered through the visual
channel. Therefore, neither channel became overloaded as only two representation codes were used together.

Moreno and Mayer (2002) further demonstrated the need for cognitive load awareness when they conducted a study among 74 college students at the University of California to examine whether students learned a concept more deeply when it was presented to them in both their visual and auditory channels. Although three experiments were conducted in this study, the first experiment examined the use of a text and audio combination to broaden learning. In the study, each participant was randomly assigned to one of five treatment groups: no treatment, N = narration alone, NT = simultaneous narration and text, AN = animation followed by narration, and ANT = animation followed by narration and text. Students were presented with computerized material on the process of lightning, using one of the five treatments. ANT required that students split their attention between words and pictures and this created an overload. Results of the study showed that presenting students with on-screen text accompanied by audio narration presented an increase in retention and construction of a mental representation of the material with no cognitive overload.

**Motivation**

**Self Determination Theory.** Ryan and Deci’s (2000) Self-Determination Theory (SDT) is based on the investigation of a person’s innate behavior including competence, relatedness, and autonomy (self-motivation). Competency is the attainment of internal and external outcomes as a result of performing an action. Relatedness is socially connecting in a secure and satisfying manner and autonomy is the self-regulation and self-initiation of one’s actions. A compilation of these three behaviors may play a large
role in another aspect of this theory – intrinsic motivation. Intrinsic motivation involves the performing of an action, such as reading a book for pleasure, simply for self-gratification without the need for reward (Deci, Vallerand, Pelletier, & Ryan, 1991). Extrinsic motivation involves the performing of an action which does not involve the interest of the action, but involves a reward as a consequence of the action. According to Deci, et.al (1991), the self-regulation of intrinsic motivation is more aligned with the theory’s premise of self-determination.

Benware and Deci (1984) conducted a study to test intrinsic motivation in college students. Participants were 43 first-year students from a Psychology course at the University of Rochester. Students were randomly assigned to two groups: 21 in the experimental group and 22 in the control group. Participants were asked to spend around three hours reading and studying a 25 page article of moderate difficulty. Students in the control group were told they would be taking an examination over the article after they finished studying and they should try and score as high as possible on the examination. Experimental students were told they would be teaching the contents of the article to other students and those whom they taught would be given an examination over the article. Data was collected using three dependent measures for assessing intrinsic motivation; (a) how interesting subjects found the contents of the learning material, (b) how enjoyable they found the experiment, and (c) how much additional time they were willing to volunteer for the experiment. Students answered questions regarding the interest, likeability, and volunteer time spent on the material using a ten-point, Likert-type scale. In addition, a 24-item comprehension exam was given to all students consisting of true/false, fill in the blanks, definitions, multiple choice, identifications, and
explanations. The study sought to determine if learning in order to teach would create a
vested behavior such as intrinsic motivation. Results showed that students who learned
the material in order to teach others possessed greater evidence of intrinsic motivation
than those who simple read the article in order to be tested. In addition, the “teaching”
students felt more active in their learning, as well as having a greater understanding of the
material. This research raised the question of intrinsic motivation and how it related to
comprehension. As this study sought to determine if motivation played a part in reading
comprehension, along with book format, it was important to determine the motivation of
post-secondary remedial reading students within this study.

Starcher and Proffitt (2011) further described SDT as the identification of two
sources of motivation; self-motivation, which is described as autonomous and innate; and
other-motivation, which is described as environmental or reactive. According to the
authors, individuals who are self-motivated should be expected to use their texts more
and engage in more reflective and deeper information processing. This theory offered an
explanation as to why some college students read their textbooks and others do not. The
Self-determination Theory was vital to this research as remedial reading students struggle
with the process of reading comprehension, which may have an effect on reading
motivation.

As this study required multiple theories to investigate the problem, Table 1
outlines the contributions, input, and outcomes found in Mayer’s (2005) CTML, Pavio’s
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<th>Theorist</th>
<th>Typical Input</th>
<th>Outcome</th>
<th>Contribution</th>
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<tbody>
<tr>
<td>Ryan and Deci (2000)</td>
<td>Social, cultural, and environmental interaction</td>
<td>Intrinsic and Extrinsic Motivation</td>
<td>Self-determination Theory</td>
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**Literature**

Before eBooks and eBooks with audio existed, Farrell (1966) recognized the promising qualities of using multimedia to assist struggling readers. He established the progressive use of television and film as a media to help slow learners and stressed the importance of combining auditory and visual clues to support these students. He acknowledged that listening comprehension far exceeded reading comprehension in struggling readers. This early research may have foretold what was yet to come in the use of audio assisted textbooks and reading comprehension.

In 2005, McNabb recognized through his research that many literacy studies were only focused on instruction through print. He further established that digital texts found in eBooks were inevitable in education. McNabb felt that incorporating technology such as digital texts into literacy content areas would give students a broader and more
enriched option for reading text and writing. He challenged educators to incorporate technology into their classrooms in an effort to determine how technology would affect the literacy areas of reading and writing. The subsequent literature tracked a path of studies which began with underprepared students and added the multimedia of eBooks and eBooks with audio to classroom instruction in an attempt to measure their effect on reading comprehension and motivation.

**Remediation**

Over one third of all students entering college are required to take remedial courses (Calcagno & Long, 2008). With the increase of remedial students in two-year colleges, the debate continues as to the cause of this growing problem and for its solution (Calcagno & Long, 2008). The lack of true experimental research due to non-random student selection has made locating reliable studies a difficult task. There have been strong quasi-experimental studies conducted and they are previewed in this literature.

Through their research, Calcagno and Long (2008) recognized the need for innovative approaches in an effort to improve the success of post-secondary remedial students. These approaches may include multimedia such as the digital text or audio found in eBooks or the approach may include the Universal Design for Learning. Biancarosa (2012) realized that introducing struggling readers to digital text can be a “boon or a barrier.” The benefits of using digitized text for remedial readers included access to definitions, search tools, and flexibility. A barrier for struggling readers was the acquisition of reading in a digital format.

A Wilkins (2010) report of 11th grade public school students in Texas revealed that many students entering college were unprepared to read a college textbook. All 11th
grade students were used in the study resulting in a sample size of 265,895. Using the Lexile Framework® for reading as a measure, data was collected from scores earned on the exit-level Texas Assessment of Knowledge and Skills for English Language Arts and Reading (TAKS–ELAR). Results from the exit exam were measured against the level of reading needed to comprehend textbooks used in entry-level English courses in the University System of Texas. The study showed that almost half of the 11th grade students in Texas public schools were not prepared to read in the University of Texas system. The results broken down showed that students were at a 75% comprehension level; 51% were able to read and comprehend 95% of the textbooks used in entry-level English courses; 80% were able to read and comprehend 50% of the textbooks; and 9% were able to read no more than 5% of the textbooks. Wilkins (2012) further examined this study and later analyzed results based on gender, race/ethnicity, economically disadvantaged status, at risk status, limited English proficiency status, English as a second language status, gifted and talented education status, career and technical education status, and special education status. Significant findings from this later report indicated that “at risk” students were significantly less prepared to read and comprehend college textbooks than students who were not at risk.

**Remedial Reading Students.** As the number of students entering college unprepared increases, the need for remediation classes also increases (Calcagno & Long, 2008). In a study performed by Byrd and McDonald (2005), the pair conducted qualitative research on eight first-generation college students over the age of 25 in their junior or senior year of college. Students were interviewed several times in an effort to determine their backgrounds and experiences as a college student. After coding and
analyzing the interviews, several themes emerged from the information gathered. It was discovered through their interviews that these college students declared reading and English as their “trouble” areas. More importantly, as juniors and seniors in college, students mentioned reading and writing as areas where that felt unprepared when entering college more than other academic areas. Students felt that vocabulary and the amount of reading required were of great concern. Six of the eight students admitted that they were underprepared when entering college. Also revealed in the study was evidence that motivation, goals, and attitudes may be a contributing factor in college students being under-prepared. Implications of this research revealed many things related to college unpreparedness, including the need to study college reading skills, college reading courses, and reading motivation. Through these outcomes, this research further demonstrated the need to assess the impact book format may have on reading skills, courses, and motivation and thus the need for the current study.

**Remedial Reading Students and Reading Comprehension/Motivation.** In a study conducted by Yang (2010), a teaching strategy entitled Reciprocal Teaching (RT) was tested in order to measure reading comprehension in college remedial reading instruction. RT is a reading process where students dialogue with their peers in an effort to increase their reading comprehension skills. There were 126 participants used in the study and participants were identified as underprepared readers. After being taught multiple reading comprehension strategies, students were encouraged to use these strategies of predicting, clarifying, questioning, and summarizing while reading. The class was taught online so that reading processes could be recorded. Students were encouraged to interact with their peers through online discussion forums. The online
processes recorded for the study did find students often used their peers to increase reading comprehension and students did use the reading strategies taught to increase reading skills. Research questions focused on the use of RT during the research. However, the most interesting finding of the study was the need for reading students to use a variety of strategies in order to increase reading comprehension.

Further acknowledging the use of multiple strategies was a study conducted by Dreyer and Nel (2003). This research employed 131 participants described as first-year South African college students considered to be “English as a Second Language” learners (ESL). After the TOEFL was administered to test English proficiency, the participants were identified as 50% “at risk” and 50% “successful.” Students were divided evenly among a control group which took a 13-week course over reading in a face-to-face environment, while the experimental group took the course online. After taking part in the 13-week strategic reading instruction module, students were administered the TOEFL which included a reading ability portion, a Reading Strategies Questionnaire, and two reading comprehension tests. Results of tests showed that all students who did not use reading strategies and had reading comprehension problems were unprepared for college coursework. A more important finding in this research came from the increase in test scores among the “at risk” students in the experimental group. The study revealed the possibility that students’ increase in comprehension of content knowledge and concepts might have been facilitated by the diagrams shown on the web pages. The study assumed that encouraging multi-modal instruction through both visual and verbal codes as presented in the online environment helped to accommodate those students who were visual learners. This study provided the knowledge that struggling readers must use a
variety of strategies while reading. Adding multimedia to reading strategies may further enhance reading comprehension and this current study will further contribute to research by addressing the use of eBooks with audio and its effect on reading comprehension.

Previous research has shown that differentiated instruction proved to be a successful approach to teaching students with disabilities in a general classroom. Servilio (2009) conducted research in classrooms (including a special education classroom) and found ways to increase grades in reading, while improving student engagement through differentiated instruction and the use of multimedia.

**Multimedia**

**Universal Design of Learning.** The Universal Design of Learning (UDL) is based on the principles of supporting diverse recognition networks, providing multiple means of representation, supporting diverse strategic networks, providing multiple means of strategic learning and expression within an apprenticeship environment, supporting diverse affective networks, and providing multiple means of engagement (Rose & Meyer, 2002). These principles must guide curricula to allow for the flexibility of differing learning styles of students. Therefore, curricula may include a range of media and new technology.

Roberts, Park, Brown, and Cook (2009) recognized the need for colleges and universities to move toward a Universal Design of Learning as a way to better serve their students. Through their investigation, they found that colleges were moving away from traditional methods of instruction and moving more toward UDL. One of the many principles used in UDL is varying instruction and providing materials in different formats, including a digital format.
A study conducted by Coyne, et al (2010) used a technology-based UDL and Literacy by Design (LBD) approach to literacy instruction. The study employed nine K-2 teachers and 16 K-2 students who were identified as having significant learning disabilities. Eight students were placed into a control group not using the LBD approach and eight students were placed in the experimental group using the LBD approach. This approach was used to assess reading literacy and was coupled with UDL-scaffolded eBooks consisting of letter and word recognition software. After being exposed to the literacy treatment 30 minutes per day during the first half of the school year, students were tested using the Woodcock-Johnson Test of Achievement III. Students were also tested at the beginning of the year before being exposed to the treatment. Pretest and Posttest results were analyzed and compared between the control and experimental groups. Results indicated that students using the LBD approach had increased reading comprehension compared to students who did not use the approach. Students also showed significant gains in word skill and listening comprehension. There were many facets to this study related to the use of the LBD approach, although the most interesting finding was related to eBook use. The eBooks were embedded with multimedia, including varying student options. Students in the study read the eBooks, responded, and interacted with the stories as intended in the UDL approach. Results indicated that technology-based UDL coupled with LBD did impact reading and listening comprehension in intellectually disabled students. The current study hoped to further expand this research by applying UDL and multimedia to a group of post-secondary remedial reading students.
Multimedia and Digital Text. Levy (2009) explored the use of a multimodal environment to teach literacy and the ways and perceptions students held while interacting with digitized text. In his research, Levy conducted interviews and collected data from 12 children ages 3-6 who were thought to be digitally competent. Students had access to books and other literary tools at home and at school. Among these books, students used computers to access digitized books with multimedia functions. Students were interviewed throughout the school year and were asked questions about their interaction with the differing forms of literacy. Data collected were manually coded and analyzed. Results suggested that being exposed to computer texts caused the children to develop a sense of confidence when working with printed text. This research showed the significance of introducing students to digitized text as a means of finding more understanding through printed text. The current research provided yet another opportunity to demonstrate how the use of multimedia in the form of eBooks with audio affected the reading comprehension and motivation levels of college remedial reading students.

Multimedia and Audio. In addition to adding digitized text, augmenting instruction through audio presentation is also used in today’s classroom. While many states prohibit the use of audio narration of standardized tests, students with learning disabilities are often allowed this audio feature. Laitusis (2010) conducted a study among fourth and eighth grade students with a Reading-based Learning Disability (RLD) and with no Learning Disability (NLD). The entire student sample was 1,181, with 903 identified as having a reading disability. Students were given the following tests in either an audio presentation or standard presentation: Gates-McGinitie Reading Test,
Woodcock-Johnson III Diagnostic Reading Battery, Reading Fluency subtest, or the Test of Silent Word Reading Fluency. Students were administered these tests in one of four groups: audio presentation with RLD, audio presentation with NLD, standard test with RLD, and standard test with NLD. Results reinforced that RLD students benefited from the audio presentation of the tests. This research also acknowledged the questionability of using audio in standardized testing, while reaffirming the benefits of listening and reading comprehension among struggling readers.

**Multimedia and Remedial Reading Students.** According to Laitusis (2010), recent studies examining the impact of adding an audio presentation to learning have discovered that they may also benefit those students with learning disabilities. A Burgess (2012) study showed the need to incorporate multimedia into remedial reading, as she sought to prove through her research. Her research examined digital literacy and reading achievement in a virtual environment among post-secondary remedial reading students. Burgess (2012) recognized the need to broaden reading instruction delivery as a potential solution for assisting struggling incoming college freshman placed into remedial reading. The first part of the study took 80 post-secondary remedial reading students in a Texas university and assessed their digital literacy. The same students were taught reading through a virtual environment entitled Second Life (SL). The study used both quantitative and qualitative instruments including the Survey of Web-Oriented Digital Literacy (SWODL) to measure digital literacy, Developmental Reading Common Final (DRCF) given as both a pretest and posttest to measure reading comprehension within SL, and observations. Results indicated that post-secondary remedial reading students are digitally literate. In addition, the results showed that the experimental group using SL for
reading instruction had an increase of 28.2% in reading achievement compared to the control group score of 19%. Student observations were recorded during reading activities and behaviors were documented. Behaviors reiterated the students’ proficiency in digital technology, as well as the students’ prudence in using peers to answer questions regarding technology. This study shows that post-secondary remedial reading students are digitally literate and using fresh ideas through digital technology can assist reading professors in the classroom. The current study hoped to provide the necessary evidence professors need to adopt eBooks with audio for college courses.

Schmitt, Hale, McCallum, and Mauck (2011) conducted a study among 25 middle-school remedial reading students. The study investigated the research question, “can the grade level comprehension of general education, remedial readers be improved by the Listening-While-Reading (LWR) accommodation using text-to-speech assistive technology” (p. 38). Although the study did not determine that a significant difference in the level of reading comprehension existed using text-to-speech technology, the research stated that the limited age and grade of the students warranted future research with a larger sampling of grade levels. This study provided the incentive to conduct further research coupling text and audio often found in eBooks and the incentive to examine their effect on reading comprehension and motivation among post-secondary remedial reading students.

**eBooks**

According to Larson (2009), the current definition of a “text” is ever-changing. Today’s reader prefers a multimodal experience using digital text and technical features. Including a multimodal experience for readers is a need educators must address in
today’s digital age. This may be accomplished by incorporating eBooks into classroom curriculum. Many eBooks contain identical text as their traditional print counterparts, while providing interactive features such as audio narration, text-to-speech options, manipulation of font size, dictionaries, and note capabilities (Larson, 2010). Offering portability, eBooks are accessible through computers, e-readers, or handheld devices.

Larson’s (2010) case study of two second grade girls showed that young readers may benefit from the many features of eBooks, including audio. As only two reading devices were available in the classroom, a low number of participants were used in this study. At the beginning of the study, the two girls were each given a portable eReader and asked to read a story on the electronic device. Although the students were considered to be average to above average readers, they often struggled with words in the story and used the many multimedia features of the device to assist them with definitions and pronunciation of words. The pair used the text-to-speech feature to listen to the story, but turned the feature off after several minutes because they did not like the sound of the device’s voice. This study advances our understanding of how multimedia features may assist young readers. Implications for the classroom exhibit the many opportunities eBooks provide for readers. One of the major implications was the use of specific features, such as audio, when the two readers were struggling with a particular passage of the book. This study exposed the potential of eBooks, as well as digital readers, while advancing past research beyond the usability and portability of eBooks.

Schugar, Schugar, and Penny (2011) add that because of the relative newness of eBooks, their effect on comprehension is still in its early stages. Therefore, there remains
a gap in research pertaining to use of eBooks with audio and their effect on comprehension scores of post-secondary remedial reading students.

**eBooks and Post-secondary Students.** As the use of eBooks increases in higher education, there have been several eBook studies conducted in a post-secondary setting. Professors Martinez-Estrada and Conway (2010) conducted an eBook pilot test among the college students at their Latin American university where over 90,000 students were enrolled. The university was used as an eBook pilot project by Amazon because of student concerns in the rising cost of traditional print textbooks. With Amazon as their liaison and provider, the university was granted use of the Kindle as the students’ eReader. Eighty-eight students used the Kindle throughout the semester and were given a mid-semester and end of the term survey over their experience with the Kindle and the eBook. The eBook was described by professors as a digital copy of the students’ regular classroom textbook with accessibility on their Kindle. In the survey, students were asked a variety of questions regarding the eReader and eBook and its usability. Discovered in the survey was the fact that nearly three-fourths of the students who were surveyed preferred the eBook version of their textbook compared to the traditional print version. Faculty at the university felt that students would rank the low cost of the eBook as a positive factor, yet that was a low priority for students. It was also assumed that students would prefer the “read aloud” feature provided for students, yet it also ranked low among the participants. The authors admitted that further research is needed to determine the reasons behind student preference. Although the current study did not address book format preference, results may lead to future research examines the relationship of book format preference to reading comprehension and motivation levels.
**eBooks and Comprehension.** A 2010 study conducted by Korat found that children who read from eBooks as an alternative to a traditional print book scored notably higher when completing typical reading skills than students who read from a print book. According to Ertem (2010), previous studies conducted concerning reading comprehension and multimedia texts were hard to interpret. Many studies focused on younger children and only compared two groups (paper text vs. electronic text), but failed to explain how struggling readers understand and read multimedia text. Therefore, Ertem’s (2010) study sought to examine the effects of electronic story books with multimedia capabilities with readers struggling in comprehension. Participants in the study consisted of 4th grade students from five elementary schools in Florida with a sample size of 77 students. The average age of the students was 9.96 years and they were selected based on reading ability one or two years below their current grade level. Participants did not meet the Sunshine State Standard (SSS) as measured by the Florida Comprehensive Assessment Test (FCAT). Students were asked to read from either a computer presentation of a storybook with animation, a computer presentation of a storybook without animation, or a printed version of the storybook. The storybook selected was “Sheila Rae the Brave” and was made available in electronic or print form. The electronic book had the multimedia capabilities of animations, a range of sounds and music, and interactive features. Students using the electronic book were able to choose “let me play” or “read to me.” After reading the story in one of the three formats, reading comprehension was measured using a multiple-choice comprehension test and retelling of the story. Results of the study for both reading comprehension scores and retelling revealed that comprehension scores were highest when reading the electronic storybook
with animation, followed by the electronic storybook without animation, and the printed storybook. This research implied that electronic storybooks can improve reading comprehension in struggling readers, yet Ertem (2010) admitted that this research did not address any increase in student motivation or enjoyment.

**eBooks and Motivation.** Schugar, Schugar and Penny (2011) conducted a quantitative study among post-secondary first-year composition students. Since students were first-year students and aware of the heavy reading load in other courses, they were allowed to self-select to become part of either the treatment group or control group. Students were assigned multiple readings followed by a Quick Write assignment. Readings could be accessed either by eReader (treatment group) or without an eReader (control group). The data collected consisted of a pre and post-survey, as well as four writings. The survey asked students if they preferred reading from the eReader or traditional book. The survey also asked their technology and reading habits. The four writings were collected after students completed the four assigned readings and took place throughout the semester. The study showed that many study participants lacked the motivation for reading. However, much of the lack of motivation may have been attributed to being a first-year, first-semester student, or adjusting to college life after high school. The study could not confirm if students lacked the motivation due to the eReader or another factor in the study. The current study examined remedial reading students who typically were first-semester students. It added further to this research as it examined the use of eBooks and eBooks with audio and how they affected reading motivation.
**eBooks with Audio.** Audiobooks are professionally narrated and recorded readings of texts, usually based on published printed books. Audiobooks are made available in multiple formats, including eBooks with audio narration. Many scholars argue that listening to a book is not considered authentic reading. However, Moyer (2011) felt that audiobooks were comparably as engaging as printed text. Likewise, scholars such as Irwin (2009) and Aron (1992) argued that listening to a book was equal to or even better than reading print books. Several studies performed in recent years have uncovered the benefits of employing eBooks with audio in the classroom.

Early research began to examine the use of audio in reading and the benefits it provided for reading students. A Montali and Lewandowski (1996) study used the bimodal presentation of visual and auditory channels concurrently to assess memory recall and reading comprehension. Participants in the study consisted of 18 average readers and 18 less proficient readers. Students were both male and female in grades eight and nine. Students were presented passages in three different modes via computer: visually (alone), auditorily (alone), and bimodally (both visually and auditorily with the digital text highlighted while a voice narrated the test). After reading the assigned passage in one of the three formats, students answered 10 questions orally, along with short-answer comprehension questions. Results of the study showed that the less proficient readers showed greater comprehension while reading in the bimodal presentation of both visual and audio. The average readers showed the same level of comprehension in a visual only mode. In addition, when presented bimodally, the low skilled readers felt more successful with their reading comprehension. This early study was vital to this research as it showed that remedial reading students might be positively
affected when reading from eBooks with audio. The study was relevant as it showed an increase in comprehension and motivation; two areas vital to this research.

The aim of research completed by Grimshaw et al. (2007) was to determine if a significant difference existed in reading comprehension scores when students used electronic storybooks with narration and without narration. Participants in the study included 81 children ages 9-11. In comparing electronic books to print books, the study found that no statistically significant difference existed between students using print and electronic books without narration. However, the study demonstrated that students reading from the eBook accompanied by audio narration had an increase in reading comprehension scores. The current study further added to this research as it investigated another age group. The current study investigated the use of eBooks with audio narration and its effect on reading comprehension levels in post-secondary students.

**eBooks with Audio and Comprehension/Motivation.** As part of a study conducted by Macaruso and Shanweiler (2010), 48 community college students were asked to participate in research which measured listening comprehension skills and decoding in order to measure reading comprehension. As part of the listening comprehension portion of the study, students were asked to listen to audio-taped sentences and select a picture which best matched the meaning of the sentence. Students were given a battery of tests which included reading comprehension, decoding, listening comprehension, reading fluency, phonological awareness, working memory, and vocabulary. Results of the tests were analyzed using a multi-regression design and sought to find the correlation of the multiple variables to a predictor of reading comprehension. Results showed a correlation among listening comprehension and decoding, but an even
stronger correlation existed among listening comprehension and vocabulary. This research was important as it provided educators and students with a recognized predictor of reading comprehension related to audio. The current study added to this research as it further provided educators and students with statistical information related to the use of eBooks with audio and their effect on reading comprehension and motivation in college remedial reading students.

**Summary of Research**

The review of literature indicated that many students who are enrolled in post-secondary institutions enter college unprepared to read college textbooks. Therefore, after scoring below the requirement on admissions testing, these students find themselves placed into remedial reading courses. Students placed into developmental courses have shown a lower rate of graduation (Calcagno & Long, 2008). Higher institutions have summoned college professors to assist with this declining rate through their instructional practices. Reading comprehension and motivation may both play a role in students being unprepared for the task of reading college textbooks. The level of comprehension may be a result of the lack of prior knowledge or it may be a result of a decrease in self-determination. Research has revealed that finding alternate ways of instructing students in reading is a good way for reading professors to assist remedial students. One method that has been revealed in research is through the addition of eBooks in the classroom. As today’s college student displays digital literacy, the many multimedia features of eBooks have proved to assist struggling readers with reading comprehension and motivation. Whether students accessed the audio, video, or the interactive features of eBooks, the popularity of eBooks have impacted the way students read. While adding eBooks and
eBooks with audio to a college remedial reading classroom is no indicator of increased reading comprehension and motivation, research is needed to determine the effect multimedia in eBooks has on post-secondary remedial reading students. Previous research has focused on the use of eBooks and comprehension or the use of audio storybooks among younger readers. Adding audio to digital text presents the two representation codes of audio and visual as outlined by Mayer (2005) and Paivio (1986), without causing a cognitive overload (Sweller, 1991). Although studies have shown success in younger readers who use multimedia in eBooks, this study represented the importance of determining its effect on college students, particularly those who begin their college enrollment in a remedial reading course.

As Chapter 2 outlined the literature related to this study, Chapter 3 used the chosen research design to describe the procedures used to collect and analyze data. Chapter 3 describes the population and sample of participants, as well as the instrumentation used in the study. Once data was collected, analysis was conducted in order to reject or confirm the hypotheses.
CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this quasi-experimental pretest, posttest nonequivalent control group study was to examine post-secondary remedial reading students’ reading comprehension and motivation levels based on the type of book they were assigned to use in their reading class. There were two theories which informed this research: Mayer’s (2005) Cognitive Theory of Multimedia Learning (CTML) and Ryan and Deci’s (2009) Self-determination Theory.

Web-based multimedia represents the presentation of instruction that involves more than one delivery media, presentation mode, or sensory modality. Recently, there has been an increase in the amount of multimedia research that is grounded in cognitive psychology and this research identifies various design principles that are both theoretically grounded and educationally applicable (Mayer, 1998). Multimedia is defined as text, sound, graphics, animation, video, imaging, or spatial modeling included in information (Dolittle, 2002). Mayer’s (2005) Cognitive Theory of Multimedia Learning (CTML) is based on the connection between verbal and audio input described as multimedia. Mayer’s (2005) CTML states that when learners are presented information encoded both verbally and visually together they remember and transfer information more effectively (Mayer & Anderson, 1991). Paivio’s (1986) Dual-Code Theory is a mainstay for CTML and professes that using two representations (visual and audio) at once is ideal for increased learning and presumes that two representations are better than one (Mayer & Gallini, 1990). However, Sweller’s (1986) Cognitive Load Theory suggests that using multiple representations may actually cause a cognitive overload in
students when graphics are accompanied by text and audio narration. The reader is producing through the verbal channel, but the visual channel becomes overloaded with text and graphics. Although increased cognitive load is a concern in using multimedia during instruction or research, for the purposes of this study, the eBook with audio was presented as on-screen text accompanied by audio narration and should not have had an effect on students’ cognitive load. In this case, according to Clark and Mayer (2003), the spoken words enter through the audio channel and the text enters through the visual channel. For this reason, neither channel becomes overloaded as only two representation codes were used together. Therefore, Mayer’s (2005) CTML and Paivio’s Dual-code Theory suggests that two representation codes are being used when employing text with audio. As a result, college remedial reading students may show an increase in reading comprehension and reading motivation scores compared to students using an eBook or print book.

As remedial reading students often lack the motivation to read (Perin, Bork, Peverly, Mason, & Vaselewski, 2011), Ryan and Deci’s (2000) Self-determination Theory was used in this study to determine if post-secondary remedial reading students were motivated to read by measuring their autonomous and controlled motivation (Park, 2013). Controlled motivation is linked to extrinsic motivation. Extrinsic motivation is described as completing a task in order to receive a particular outcome. Extrinsic motivation may also be described as students who are motivated when an external motivator exists, such as increased scores in reading comprehension. If students score higher on reading comprehension tests while using eBooks or eBooks with audio, then students may be more extrinsically motivated to read based on the perceived outcome.
Autonomous motivation is related to intrinsic motivation. Intrinsic motivation is described as completing a task simply for self-gratification. Research on reading motivation has shown that reading larger amounts of text is related to students’ intrinsic motivation more than additional types of motivation (Lau, 2009). If eBooks with audio narration is able to decrease the reading load in remedial reading students, then students who lack the motivation to read large amounts of text may show an increase in intrinsic motivation and thereby an increase in self-gratification when reading from an eBook with audio. Autonomous motivation has been associated with positive outcomes in students, whereas controlled motivation has been unrelated to outcomes (Powers, Koestner, & Zuroff, 2007).

Using the CTML, this study sought to determine if reading from eBooks or eBooks with audio had an effect on reading comprehension scores of college remedial students compared to those remedial reading students reading from print books. Ryan and Deci’s (2000) Self-determination Theory tests a college student’s motivation to read when using eBooks, eBooks with audio, and print books.

Chapter 3 identified the research design and why it was appropriate for this study. The questions and hypotheses are restated, as well as the identification and description of participants used in the study. The setting is described, along with the testing location and treatment and control groups. Instrumentation used in the study is identified, in addition to the procedures used for collecting data. The analysis is briefly explained.

**Design**

A quasi-experimental pretest, posttest nonequivalent control group research design was used for this study to determine if using eBooks, eBooks with audio, and print
books affect reading comprehension scores and motivation levels in post-secondary remedial reading students. The rationale for choosing a quasi-experimental design was based on using manipulation of variables without random assignment of participants for this study (Gall, Gall, & Borg, 2007). Consistent with the features of a quasi-experimental design, existing groups or intact groups were used. The participants of interest in this study were post-secondary remedial reading students; students scoring below 77% on the ACT Compass®. These students were required to take a remedial reading course as a result of their score. As each student registered for remedial reading on his or her own, they assigned themselves a classroom through the act of enrolling for the class.

As participants enrolled in the remedial reading class of their choice; intact classrooms existed and formed the three groups used in this study making random assignment impossible. However, the participants’ classes were randomly assigned a level of treatment and a group number (eBook, eBook with audio, or print book) according to the course registration number. As course numbers are sequential, the first course number was considered Group 1, the second course number was Group 2, and the third course number was Group 3. Once each class had been assigned a group number, the research was conducted in three separate classrooms labeled Group 1 (control group), Group 2 (experimental group with eBook), and Group 3 (experimental group with eBook and audio).

Also a pretest and posttest was used in this study so that any differences between groups were detected through the proper analysis. Students from each group were given a reading comprehension pretest and a reading motivation pre-survey prior to reading the
module from their assigned book format and then took the reading comprehension posttest and reading motivation post-survey after the treatment. According to Gall, Gall, and Borg (2009), using a control group design assists in controlling for threats to internal validity inherent in the design. The pretest, posttest nonequivalent control group design effectively minimized internal threats to validity; the selection threat to validity was controlled by statistically holding the pretest scores constant for all groups while examining differences in the pretest scores. Therefore, Group 1, Group 2, and Group 3 were given a reading comprehension pretest and a reading motivation pre-survey during the tenth week of the semester. Participants then received the treatment of reading a module through their assigned book format during the thirteenth week of the semester and were immediately given an identical reading comprehension posttest and reading motivation post-survey following the treatment. The diagram in Figure 2 shows the order in which the pretest and posttest were administered.

Figure 2. Diagram of the pretest, posttest design.
Research Questions

The research questions for this study were:

**RQ1:** Is there a statistically significant difference in reading comprehension scores of remedial reading college students using an eBook, an eBook with audio, and a print book, while controlling for the pretest?

**RQ2:** Is there a statistically significant difference in motivation levels of those college remedial reading students using an eBook and an eBook with audio compared to students using a print book, while controlling for the pre-survey?

Participants

The study participants consisted of a convenient sample of approximately 99 college remedial reading students from a two-year technical college in Northwest Georgia. A convenient sampling was used in the study, as participants were easily accessible to the researcher due to voluntary enrollment in remedial reading and the location of the research institution. According to the institution’s website, the college has an annual average enrollment of approximately 6,185 students. The student population was 37.5% male and 62.5% female, with 63.9% of enrolled students considered freshman. Ethnicity of the student body was 13.3% African American, 0.3% American Indian, 1.8% Asian, 5.7% Hispanic, 1.9% Multiracial, and 76.5% Caucasian. Approximately 2.5% of students attending this institution were enrolled in remedial reading courses. Demographic data of participants was collected while administering the pre-survey entitled Learning Self-Regulation Questionnaire (SRQ-L). Students were asked on the survey to identify their ethnicity, age, and gender.

Participants were required to take the reading portion of the ACT Computer Adaptive Placement Assessment and Support System (ACT Compass®) test as part of the
admissions process of the college. Students who scored below 77% on the reading portion of the ACT Compass® were asked to enroll in remedial reading in order to satisfy the institution’s requirements towards completing a degree, diploma, or certification in one of eight programs; including Automotive, Aviation, Business, Computers, Healthcare, Industrial, and Early Childhood Education. The research institution enrolled a total of 1,394 students in its remedial math, English, and reading courses with 242 of those students enrolled in remedial reading. Using a population size of 242 remedial reading students and a margin of error of 0.05%, a sample size of 99 participants with a confidence level of 0.80% was calculated using the Raosoft website.

The participants’ classes were randomly assigned a book format. All students participated in the treatment assigned to their course. However, as each student received an informed consent form, only those wishing to participate returned a completed form in order to participate in the study. Those not wishing to participate in the study did not have their comprehension and motivation results used in the study. There were three students from the eBook group and four students from the eBook with audio group who chose not to participate in the study. However, all students from the print book group chose to participate. Students who choose not to participate continued in the courses; however, their data was not included in the study. The consent forms were collected by the reading instructor and returned to the researcher.

Setting

The research was conducted in a two-year technical college in Northwest Georgia. Data was collected from three remedial reading classrooms with one classroom reading from an eBook, one classroom reading from an eBook with audio, and one classroom
reading from a print book. Remedial reading classes met twice per week for 1 ½ hours during the 16 week semester. Reading classrooms were labeled Group 1 (control group – print book), Group 2 (experimental group - eBook), and Group 3 (experimental group – eBook with audio) and were located in a computer lab with approximately 25 - 30 computers available. Computers throughout the school were less than three years old and were equipped with Microsoft Windows™ 2007, as well as equipped with speakers and headphones.

Students in Group 1 read the print book with the text printed on paper. The print text was identical to the digital text found in the eBook and eBook with audio format. Students in Group 2 read the module by eBook and accessed the module through MyReadingLab™. Although audio features existed in the module, students in Group 2 did not have headphones to access the audio feature. Students in Group 3 read the module by eBook with audio and accessed the module through MyReadingLab™. These students were required to wear headphones connected to their computer and were required to access the digital text along with the accompanying narrated audio recording of the text.

The reading instructor for each of the three groups was the same. The instructor was a female approximately 50 years of age. She was an assistant professor of reading and held a Master’s degree in Literacy. She has taught remedial reading at the research institution for approximately fifteen years. The instructor has used MyReadingLab™ for less than one year, but she was familiar with this software.

MyReadingLab™ is an online program that assists struggling readers in advancing their reading skills through remediation. MyReadingLab™ is a part of Pearson Education, Inc. Students may only access MyReadingLab™ online by going to Pearson’s
website. All students were required to gain access to MyReadingLab by using only desktop computers located in the classroom. Participants accessed MyReadingLab™ using their student username and password and used MyReadingLab™ in all three groups to take the reading comprehension test. Students using MyReadingLab™ were asked to read 15 modules over the course of a semester. Each module contained an overview, model, recall, and animation describing and outlining the subject of the module. After reading the module, students were asked to take a posttest over the module consisting of ten comprehension questions. Students must have scored a 70% on the posttest in order to complete the module satisfactorily. Students read each module in MyReadingLab™ on a desktop computer screen as digital text and then took the posttest in MyReadingLab™.

As students traditionally use the eBook format in MyReadingLab™, for the purposes of this study, the module was printed for students assigned the print book format. Students assigned the eBook format accessed the Module through MyReadingLab™ as digital text. The module also contained the capabilities of audio narration so that students assigned the eBook with audio format could listen to an audio version of the digital text as they read. Students assigned the eBook with audio format were given headphones which they plugged into their classroom desktop computer in order to access the audio narration. Students read the module from their assigned format during class time. Students could not access the module at home and were required to complete the module, comprehension test, and the pre and post Learning Self-Regulation Questionnaire (SRQ-L) during class time.
Instrumentation

The independent variable identified in this study was book format. Book format included an eBook, an eBook with audio, and a print book. The dependent variables identified in this study were reading comprehension scores and motivation levels.

The eBook was defined as a module over Purpose and Tone which was located in Pearson’s MyReadingLab™. All students in the remedial reading course were required to purchase MyReadingLab™ at the beginning of the semester as part of the course. Students used MyReadingLab™ for approximately eight weeks before any data was collected for this study. MyReadingLab™ was used daily in participants’ remedial reading class. Therefore, the eBook was the typical book format used and students should have been familiar with the MyReadingLab™ program.

The module used for this study was over Purpose and Tone and was found in MyReadingLab™. The module consisted of a two-page, 388 word overview over Purpose and Tone; a five-page, 1,217 word model of Purpose and Tone; and an eight-slide presentation over Purpose and Tone that could be viewed as animation, e-text, or print.

Reading comprehension scores were measured using a reading comprehension test over Purpose and Tone (Figure 7) and made available in Pearson’s MyReadingLab™. The reading comprehension pretest and posttest were identical. The test consisted of 10 multiple choice questions related to a reading passage required at the end of the module over Purpose and Tone. The first five questions were related to a reading passage over the Mona Lisa. The next five questions pertained to a reading passage over politics.
Scores on the comprehension test ranged from 0-100, with each question accounting for 10 possible points and a maximum score of 100. Reliability of the instrument was established by administering a Cronbach alpha test (Cronbach, 1970). Face and content validity of the instrument was measured by having three professors of reading examine the appropriateness of the reading comprehension questions to measure comprehension of the content reviewed in class. Of the three reading professors, all have taught remedial reading in University System of Georgia classrooms; one was a reading professor with a Ph.D. in Educational Psychology, and the remaining two were assistant reading professors with Master’s degrees in Reading and Literacy. A rubric (Appendix D) was completed by all professors after examination of the module over Purpose and Tone and the instrument was unanimously endorsed.

The reading comprehension pretest and posttest were administered online through MyReadingLab™. Students were given 30 minutes to complete the pretest and posttest. The posttest was given after the treatment and was administered in the same manner as the pretest. Below is a screen shot sample of the module over Purpose and Tone; including Figure 3 Overview, Figure 4 Model, and Figure 5 Animation.
Figure 3. Screenshot of the Overview of Purpose and Tone

Figure 4. Screenshot of the Model of Purpose and Tone
Reading motivation levels were measured using a Learning Self-Regulation Questionnaire (SRQ-L) (Black & Deci, 2000). Ryan and Deci’s (2009) Self-
determination theory was used to develop this domain-specific strategy for recognizing styles and determining if they were controlled versus autonomous. This approach was first used by Ryan and Connell (1989) and resulted in the Self-Regulation Questionnaire (SRQ). The SRQ examined individuals and why they employ certain behaviors. This scale has been used in a range of areas, including relationships, religion, health, and education. The SRQ developed into the Learning Self-Regulation Questionnaire (SRQ-L) which was used to measure what motivated a student to learn in a particular setting. The SRQ-L has been adapted multiple times and originated from an SRQ designed for use in the study of elementary students and their academic motivation (Ryan & Connell, 1989). It was later used in adapted form in the research of second-year medical students to determine the consequences of being autonomous in academic learning (Williams & Deci, 1996). The SRQ-L used in this study has also been adapted from previous versions. The questions in this questionnaire were adapted to contain students’ responses as they related to the actual remedial reading course. An excerpt from the reading motivation scale was “I am likely to follow my instructor's suggestions for reading a college textbook.” Students responded to that phrase by rating it on a scale of 1-7, along with the following sample of phrases: “Because I would get a good grade if I do what he/she suggests,” “Because I believe my instructor's suggestions will help me read a college textbook effectively,” and “Because I want others to think that I am a good reader” (Black & Deci, 2000).

The Learning Self-Regulation Questionnaire (SRQ-L) was administered by paper and pencil and contained two separate sections over “Learning” and “Reasons for learning.” The “Learning” section contained 14 questions and the “Reasons for learning”
section contained 12 questions. These questions were divided into three groups of items. Items were rated on a scale of 1 to 7, with 1 = not at all true, 4 = somewhat true, and 7 = not true. The items were written to represent both controlled (i.e., external and introjected) and autonomous (i.e., integrated) reasons for why students are motivated to read. The students responded to items on a 7-point Likert-type scale. Scoring for the two sections were broken down into two subscales: autonomous regulation, and controlled regulation. Under the “Learning” section, the subscale referred to as autonomous regulation contained the following questions: 1, 3, 6, 9, 11, 13, and 14. The subscale referred to as controlled regulation contained the following questions: 2, 4, 5, 7, 8, 10, and 12. Under the “Reasons for Learning” section, the subscale referred to as Autonomous regulation contained the following questions: 1, 4, 8, 9, and 10. The subscale referred to as Controlled regulation contained the following questions: 2, 3, 5, 6, 7, 11, and 12. The alpha reliability for the two subscales in each section was approximately 0.75 for controlled regulation and 0.80 for autonomous regulation. When analyzing scores, the two subscales under each section were calculated separately by totaling the sum of scores for each subscale. Once each subscale was totaled, the participant received a score for that subscale. As autonomous and controlled regulation were being measured, the highest total score for each subscale was considered the participant’s predominant motivation type (Williams & Deci, 1996).

Construct of validity of the motivation scale instrument was apparent through empirical research. The Learning Self-Regulation Questionnaire (SRQ-L) was developed for use in a study which was conducted in a medical school course.
The study included students learning to perform medical interviewing and was one of the first of two versions of the scale to be produced (Williams & Deci, 1996). The second scale was marginally adapted for a study conducted using college students who were learning organic chemistry. The study’s analyses revealed that autonomous motivation reasons also correlated with results from a General Causality Orientations Scale (GCOS) (Deci & Ryan, 1985) also used in the study (Black & Deci, 2000). Because of these correlations, some construct of validity was provided for the SRQ-L (Black & Deci, 2000)

Procedures

Approval of the research institution was obtained by contacting the Vice President of Academic Affairs by email. A formal letter was written requesting permission to conduct research at the institution (Appendix A). Also attached to the email was a copy of the student consent letter, as well as the instruments used in the study (Appendix B). In addition, an IRB form was filled out and submitted to Liberty University for approval. Once IRB approval was received, the reading professor was contacted and made aware of the study by email.

The reading professor notified remedial reading students enrolled in the six selected classrooms of the study. As all participants enrolled in remedial reading were taking the course in a face-to-face format, the professor notified students during their
class time. The study was explained to the students by their reading instructor. The instructor explained that the study would be conducted to determine if the book formats of eBook, eBook with audio, or print book would have an effect on college remedial reading students’ reading comprehension and motivation levels. Students were informed that their participation in the study was strictly voluntary and would have no bearing on their grade. The instructor explained that all students in the remedial reading course would read a module on Purpose and Tone in their assigned book format regardless of their wish to participate in the study. However, those who did not wish to participate would not have their results used as part of the study. There were three students from the eBook group and four students from the eBook with audio group who chose not to participate in the study. However, all students from the print book group chose to participate. Students who choose not to participate continued in the courses; however, their data was not included in the study.

The instructor explained that there would be four steps followed in order to participate in the study. Students were given an informed consent which was completed and signed expressing their wish to participate in the study (Appendix B). Students took a pretest over Purpose and Tone before reading the module and also completed a reading motivation pre-survey entitled Learning Self-Regulation Questionnaire (SRQ-L). Students then read the module over Purpose in Tone in their assigned book format. Finally, students took a posttest over Purpose and Tone along with a Learning Self-Regulation Questionnaire (SRQ-L) post-survey.

Those students returning a consent form were considered a participant in the study and according to which class they enrolled in were assigned to either Group 1 (control
group – print book), Group 2 (treatment group – eBook), or Group 3 (treatment group - eBook with audio). Students in Groups 2 and 3 accessed their eBook and eBook with audio through MyReadingLab™ on computers located in the classroom.

Each of the three groups completed equivalent expectations. The reading comprehension pretest and the Learning Self-Regulation Questionnaire (SRQ-L) pre-survey were given during the tenth week of the semester to both the control and experimental groups. The pretest was described as a 10 question comprehension test over Purpose and Tone administered through MyReadingLab™. There was no instruction over Purpose and Tone before the pretest was administered, thereby ensuring fidelity of the data. Typically, Purpose and Tone was taught during the 13th week of the semester, therefore students had no introduction to the content. Following the pretest taken in MyReadingLab™, scores for each pretest were automatically determined by the online program. In addition, after students completed the reading comprehension pretest, they received the Learning Self-Regulation Questionnaire (SRQ-L) which measured reading motivation. The Learning Self-Regulation Questionnaire (SRQ-L) was given as a pre-survey.

After the pretest was given during the tenth week of the semester, each group was asked to read the module over Purpose and Tone during the thirteenth week of the term. As classes met twice per week, students read the module during the first class meeting of the week. Group 1 was asked to read the module over Purpose and Tone from a print book. The print book was described as an exact printed transcript of the both the eBook and eBook with audio module. It consisted of a two-page, 388 word overview on Purpose and Tone; a five-page, 1,217 word model of Purpose and Tone; and a printed copy of the
eight-slide presentation over Purpose and Tone which included the exact wording of the
eBook. Group 2 was asked to read the same module over Purpose and Tone from an
eBook located in Pearson’s MyReadingLab™. The eBook was merely digital text on a
computer screen. Group 3 was asked to read the same module over Purpose and Tone
from an eBook with audio located in Pearson’s MyReadingLab™. Students were
provided with headphones to access the audio. The digital text located in the eBook was
accompanied by audio narration identical to the text.

After students read the module over Purpose and Tone in their assigned format,
they were asked to take a 10 question reading comprehension test over the module. The
test was administered by the reading instructor during the second meeting of the class
during week thirteen of the semester. This test was considered the reading comprehension
posttest and questions were identical to the reading comprehension pretest.

Results from the pretest and posttest were accessed through MyReadingLab™
and printed by the reading instructor. The researcher obtained a copy of the reading
comprehension pre and posttest results from the reading instructor and recorded the
results by replacing participant names with a corresponding Arabic number in order to
preserve anonymity and to correctly record numbers for analyses.

After the posttest was given, remedial reading students participating in the study
again received the Learning Self-Regulation Questionnaire (SRQ-L) which measured
their reading motivation. The Learning Self-Regulation Questionnaire (SRQ-L) was
given as a post-survey. Results for the Learning Self-Regulation Questionnaire (SRQ-L)
pre and post-survey were calculated manually by the researcher and students’ names were
deleted and replaced with an Arabic number in order to ensure confidentiality of the
participant. Results of the Learning Self-Regulation Questionnaire (SRQ-L) pre and post-survey were recorded by the researcher and results were analyzed. A timeline of the testing procedures is shown in Figure 7 below.

<table>
<thead>
<tr>
<th>10th week of the semester</th>
<th>13th week of the semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students completed the Learning Self-regulation Questionnaire/pre-survey (Black &amp; Deci, 2000)</td>
<td>Students took the reading comprehension pretest over Purpose and Tone in MyReadingLab</td>
</tr>
<tr>
<td>Wednesday/Thursday, Students took the posttest over Purpose and Tone in MyReadingLab</td>
<td></td>
</tr>
<tr>
<td>13th week of the semester</td>
<td>Students completed the Learning Self-Regulation Questionnaire/post-survey (Black &amp; Deci, 2000)</td>
</tr>
</tbody>
</table>

Figure 7. Timeline of testing procedures.

**Data Analysis**

**Analysis of comprehension.** This study compared the comprehension scores of each of the three groups. The following hypothesis was tested:

\[ H_1: \text{College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in reading comprehension scores, as measured using a reading comprehension test, while controlling for the pretest.} \]
In order to test this hypothesis, a reading comprehension pretest was first conducted and data was analyzed using one-way analysis of variance (ANOVA). A pretest was necessary in this study as the control group and treatment groups needed to be examined for equality, as group selection was not random and groups may have had pre-existing differences (Campbell & Stanley, 1963). Results from the ANOVA indicated no significant difference between the three groups on the pretest. Therefore, the pretest was not used as a covariate, and a one-way ANOVA was then conducted on posttest results (Dimitrov & Rumrill, 2003). In order to test the hypothesis, an alpha level of $p < 0.05$ was used in order to reject or fail to reject the null hypothesis (McLean & Ernest, 1998). As a one-way ANOVA was used, the effect size was interpreted using Cohen’s conventions and reported as partial eta squared (Cohen, 1973).

Prior to analysis, assumption testing was performed on reading comprehension pre and posttest scores to determine whether the following assumptions were tenable: normality, homogeneity of variance, and extreme outliers. Normality was assessed using the Shapiro-Wilk test, extreme outliers were assessed using box plots, and equal population variance was assessed using Levene’s test of homogeneity.

**Analysis of motivation.** This study analyzed the reading motivation survey data. College remedial reading students using an eBook, eBook with audio, and print book were compared. The following hypothesis was tested:

**H$_2$:** College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the linear combination of the reading motivation scales as measured using the Learning Self-determination Questionnaire (SRQ-L), while controlling for the pre-survey.
The Learning Self-Regulation Questionnaire (SRQ-L) pre-survey scores were analyzed using a one-way Multivariate Analysis of Variance (MANOVA). A MANOVA was the best statistical method of analysis as two related subscales were analyzed (Tabachnick & Fidell, 2007). The MANOVA combined the two related dependent variables to form a composite variable to examine for the linear composite of the means between groups. In doing so, using the MANOVA maximized the differences between the groups of the independent variable.

An alpha level of \( p < 0.05 \) was used in order to reject or fail to reject the null hypothesis (McLean & Ernest, 1998). The effect size was interpreted using Cohen’s conventions and reported using partial eta squared (Cohen, 1973). Assumption testing was conducted prior to the analysis to determine whether the following assumptions were admissible: sample size, normality, outliers, homogeneity of variance-covariance, linearity, and multicollinearity. The homogeneity of variance-covariance was tested using the Box’s M Test. Scatterplots were used to assess for linearity, and Pearson correlation was used to assess for multicollinearity/singularity. The Shapiro-Wilk statistic was used to check univariate normality, and univariate outliers were examined using boxplots. Mahalanobis distance statistic was used to examine multivariate outliers, and assumption of homogeneity of variances was assessed by Levene's test of homogeneity of variance (Tabachnick & Fidell, 2007).

There was a significant difference found in pre-survey results. Therefore, follow-up univariate ANOVAs were run to determine if either of the subscales needed to be used as a covariate in the final analysis. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each ANOVA was tested at a significance level of
.025. Using this adjusted significance level, pre-survey results were analyzed and did not reach statistical significance. Therefore, pre-survey results were not used as a covariate and a MANOVA was run on Learning Self-Regulation Questionnaire (SRQ-L) post-survey results (Tabachnick & Fidell, 2007).

A MANOVA was run on Learning Self-Regulation Questionnaire (SRW-L) post-survey results using an alpha level of $p < 0.05$. Assumption testing was conducted prior to the analysis to determine whether the following assumptions were admissible: sample size, normality, outliers, homogeneity of variance-covariance, linearity, and multicollinearity. The homogeneity of variance-covariance was tested using the Box’s M Test. Scatterplots were used to assess for linearity and Pearson correlation was used to assess for multicollinearity/singularity. The Shapiro-Wilk statistic was used to check univariate normality, and univariate outliers were examined using boxplots. Mahalanobis distance statistic was used to examine multivariate outliers, and assumption of homogeneity of variances was assessed by Levene's test of homogeneity of variance (Tabachnick & Fidell, 2007).

There was a significant difference found in post-survey results. Therefore, univariate analyses of variance (ANOVAs) for each dependent variable were conducted as follow-up tests to the MANOVA. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each ANOVA was tested at a significance level of .025. Using this adjusted significance level, no statistically significant difference was found among groups in autonomous and controlled Learning Self-Regulation Questionnaire (SRQ-L) post-survey results (Tabachnick & Fidell, 2007).
The Research Process Map depicted in Table 2 shows the data analyses used in the study and how it connected to theoretical framework, research questions, and data sources.

Table 2
*Research Process Map*

<table>
<thead>
<tr>
<th>Theoretical framework</th>
<th>Research Questions</th>
<th>Data Needs</th>
<th>Data Sources</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mayer’s (2000) Cognitive Theory of Multimedia Learning</td>
<td>Is there a statistically significant difference in the reading comprehension scores of those post-secondary remedial reading students using an <strong>eBook and an eBook with audio</strong> compared to students using a print book?</td>
<td>Audio</td>
<td>eBook and eBook with audio</td>
<td>ANOVA</td>
</tr>
<tr>
<td>Ryan and Deci’s Self-Determination Theory</td>
<td>Is there a statistically significant difference in the <strong>motivation</strong> levels of those post-secondary remedial reading students using an eBook and an eBook with audio compared to students using a print book?</td>
<td>Motivation</td>
<td>Motivation Scale pre-survey and post-survey with multiple subscales</td>
<td>MANOVA</td>
</tr>
</tbody>
</table>

Chapter 4 will begin with restatement of the purpose of the study. It will also include the data collected and analyzed and will show the results of the analysis. In addition, the findings of the analysis will be detailed and how they relate to the relative
CHAPTER FOUR: FINDINGS

Introduction

Chapter four includes a summary of the results for each research question contained in this study, as well as a description of the study’s hypotheses. The data reported in Chapter four was used to establish the effect on reading comprehension and motivation in post-secondary remedial reading students when using an eBook, eBook with audio, or print book. Reading comprehension and motivation data were collected from 67 post-secondary remedial reading students and statistical analyses were conducted to compare the data between the study’s eBook group, eBook with audio group, and print book group.

Comprehension scores and motivation levels of the groups were analyzed to determine if there was a significant statistical difference from the group using the eBook, the eBook with audio, and the print book.

Question One

Descriptive Statistics for Pretest Scores

The first research question was: Is there a statistically significant difference in the reading comprehension scores of those post-secondary remedial reading students using an eBook and an eBook with audio compared to students using a print book, while
controlling for the pretest? A one-way ANOVA test was performed on pretest scores to determine if a statistically significant difference existed between the experimental groups and the control group in the level of reading comprehension as measured using raw scores from the reading comprehension pretest. Book format assignment, control (print book) and experimental (eBook and eBook with audio), were used as the independent variable. The means and standard deviations for reading comprehension pretest scores are reported in Table 3.

Table 3

*Descriptive Statistics for Reading Comprehension Pretest Scores based on Book Format Assignment (N = 67)*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>eBook (n = 22)</td>
<td>eBook with audio (n = 20)</td>
<td>print book (n = 21)</td>
</tr>
<tr>
<td>Reading Comprehension Pretest Scores</td>
<td>46.82 15.85</td>
<td>46.50 13.09</td>
<td>41.60 13.44</td>
</tr>
</tbody>
</table>

**Assumption Testing for Pretest Scores**

Assumption testing was performed on reading comprehension pretest scores to determine whether the following assumptions were tenable: normality, homogeneity of variance, and extreme outliers. Normality was assessed using the Shapiro-Wilk test, and extreme outliers were assessed using box plots. Reading comprehension pretest scores were normally distributed for the eBook, eBook with audio, and print book groups, as
assessed by Shapiro-Wilk’s test of normality ($p > .05$). There were no extreme outliers present in the data, as assessed by inspection of the boxplots.

The one-way ANOVA assumes that the population variances of the dependent variable are equal for all groups of the independent variable (Tabachnick & Fidell, 2007). Therefore, equal population variance was assessed using Levene’s test of homogeneity. The assumption of homogeneity of variances was met, as assessed by Levene's Test of Homogeneity of Variance ($p = .57$).

**Inferential Statistics for Pretest Scores**

A one-way ANOVA was conducted to determine if reading comprehension pretest scores were different for groups with differing book formats. Participants were classified into three groups: print book ($n = 25$), eBook ($n = 22$), and eBook with audio ($n = 20$). These three book format groups was not statistically significant, $F(2,64) = 1.00, p = .37$. As there was no statistically significant difference in reading comprehension pretest scores among the three groups, the pretest was not used as a covariate, and a one-way ANOVA was then conducted on posttest data (Dimitrov & Rumrill, 2003).

**Descriptive Statistics for Posttest Scores**

A one-way ANOVA test was performed on posttest scores to determine if a statistically significant difference existed between the experimental groups and the control group in the level of reading comprehension as measured using raw scores from the reading comprehension posttest. Book format assignment, control (print book) and experimental (eBook and eBook with audio), were used as the independent variables. The means and standard deviations for reading comprehension posttest scores are reported in Table 4.
Table 4  
**Descriptive Statistics for Reading Comprehension Posttest Scores based on Book Format Assignment (N = 67)**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group eBook (n = 22)</th>
<th>Experimental Group eBook with audio (n = 20)</th>
<th>Control Group print book (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Comprehension Pretest Scores</td>
<td>$M$  47.73  $SD$  19.50</td>
<td>$M$  57.50  $SD$  13.33</td>
<td>$M$  50.00  $SD$  16.33</td>
</tr>
</tbody>
</table>

**Assumption Testing for Posttest Scores**

Assumption testing was performed on reading comprehension posttest scores to determine whether the following assumptions were acceptable: Normality, homogeneity of variance, and extreme outliers. Normality was assessed using the Shapiro-Wilk test, and extreme outliers were assessed using box plots. Reading comprehension posttest scores were normally distributed for the eBook, eBook with audio, and print book groups, as assessed by Shapiro-Wilk test of normality ($p > .05$). There were no extreme outliers present in the data, as assessed by inspection of the boxplots. The assumption of homogeneity of variances was met, as assessed by Levene's test of homogeneity of variance ($p = .39$).
Inferential Statistics for Posttest Scores

A one-way ANOVA was conducted to determine if reading comprehension posttest scores were different for groups with differing book formats. There was no statistically significant difference \( (p < .05) \) found among the three groups, \( F(2,64) = 1.96, p = .15; \) partial \( \eta^2 = .06 \). The observed power was .39, which indicated a 39% probability that failing to reject the null hypothesis was correct. Thus, a Type II error was possible. Since there was no statistically significant difference between means \( (p < .05) \), the following null hypothesis was rejected:

\( H_0: \) College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in reading comprehension scores, as measured using a reading comprehension test, while controlling for the pretest.

Question Two

Descriptive Statistics for Pre-survey Scores

The second research question was, “Is there a statistically significant difference in motivation levels of those college remedial reading students using an eBook and an eBook with audio compared to students using a print book, while controlling for the pre-survey?” A one-way multivariate analysis of variance (MANOVA) was performed to identify whether a significant difference between the experimental groups and the control group in the level of reading motivation associated with book format existed. The two subscales of the Learning Self-Regulation Questionnaire (SRQ-L) pre-survey served as the dependent variables. These variables included autonomous motivation and controlled motivation. Group assignment, the experimental groups and the control group, was used as the independent variable.
The means and standard deviations for each of the 2 subscales in the reading Learning Self-Regulation Questionnaire (SRQ-L) pre-survey are represented by the participants’ group assignments and reported in Table 5.

Table 5
Descriptive Statistics for Learning Self-Regulation Questionnaire (SRQ-L) Pre-survey based on Group Assignment (N=67)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group eBook (n = 22)</th>
<th>Experimental Group eBook with audio (n = 20)</th>
<th>Control Group print book (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Motivation</td>
<td>$M = 61.95$  $SD = 12.05$</td>
<td>$M = 66.55$  $SD = 11.77$</td>
<td>$M = 69.76$  $SD = 10.85$</td>
</tr>
<tr>
<td>Controlled Motivation</td>
<td>$M = 56.68$  $SD = 12.56$</td>
<td>$M = 67.55$  $SD = 14.59$</td>
<td>$M = 63.52$  $SD = 11.28$</td>
</tr>
</tbody>
</table>

Assumption Testing for Pre-survey Scores

Prior to conducting a MANOVA on Learning Self-Regulation Questionnaire (SRQ-L) pre-survey results, assumption testing was completed to determine whether the following assumptions were admissible: sample size, normality, outliers, homogeneity of variance-covariance, linearity, and multicollinearity/singularity. For a MANOVA, there should be more cases in each cell than total dependent variables for the study (Tabachnick & Fidell, 2007). For this study, the sample size assumption was satisfied by having at least 20 cases in each cell with only 2 dependent variables. The Shapiro-Wilk
statistic was used to check univariate normality. Autonomous motivation and controlled motivation were normally distributed for each book format ($p > .05$).

Additional statistics were run to assess normality and univariate outliers where histograms and boxplots were examined. Boxplots revealed one outlier for the autonomous motivation scale within the print book group. The outlier was checked to ensure it was not the result of a recording error (Gall et. al., 2007). Since a MANOVA is tolerant of outliers if values are not too extreme and $N >$ the number of dependent variables, the outlier was not removed (Tabachnick & Fidell, 2007). The outlier was modified by replacing the value with the next closest value which was not an outlier, but only slightly larger (Tabachnick & Fidell, 2007). A Mahalanobis distance statistic was calculated to examine multivariate outliers. The Mahalanobis distance values were assessed using two dependent variables, so the distance values were compared against a critical value of 13.82 to determine if there was a violation of this assumption within the data set (Cohen, 1988). There were no violations of this assumption as the largest case number was 7.02 and was not larger than the critical value of 13.82, indicating a lack of multivariate outliers for this study. The assumption of homogeneity of variances was tenable, as assessed by Levene's test of homogeneity of variance (autonomous motivation, $p = .92$; controlled motivation, $p = .54$). The assumption of homogeneity of variance-covariance was tested using the Box’s M Test. There was homogeneity of variance-covariances matrices ($p = .79$).

In order to determine if a linear relationship existed between dependent variables for each group, a scatterplots was generated to check for linearity assumptions. As assessed using the scatterplots, there was a linear relationship between autonomous and
controlled motivation. A Pearson’s $r$ correlations was conducted to examine multicollinearity among the dependent variables. There was no evidence of multicollinearity ($r = .48, p < 0.001$), but there was a significant relationship suggested indicating a MANOVA was a suitable analysis (Tabachnick & Fidell, 2007).

A MANOVA was run on Learning Self-Regulation Questionnaire (SRQ-L) pre-survey results using a significance level of .050. Using the Wilks Lambda, a statistically significant difference between the groups on the combined dependent variables was found, $F(4, 126) = 2.81, p = .028$; Wilks’ $\Lambda = .84$; partial $\eta^2 = .08$. Therefore, follow-up univariate ANOVAs were run to determine if either of the subscales needed to be used as a covariate in the final analysis of post-survey results. Univariate analyses of variance (ANOVARs) for each dependent variable were conducted as follow-up tests to the MANOVA. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each ANOVA was tested at a significance level of .025. Using this adjusted significance level, no statistically significant difference was found among groups in autonomous and controlled Learning Self-Regulation Questionnaire (SRQ-L) pre-survey results in the follow up tests. As no statistical significance was found in pre-survey scores analyzed in the univariate ANOVAs, a MANOVA was run on Learning Self-Regulation Questionnaire (SRQ-L) post-survey results without using the pre-survey scores as a covariate (Tabachnick & Fidell, 2007).

**Descriptive Statistics for Post-survey Scores**

A one-way multivariate analysis of variance (MANOVA) was performed to identify whether a significant difference between the experimental groups and the control group in the level of reading motivation associated with book format existed. The two
subscales of the reading Learning Self-Regulation Questionnaire (SQR-L) post-survey served as the dependent variables. These variables included autonomous motivation and controlled motivation. Group assignment (the experimental groups and the control group) was used as the independent variable.

The means and standard deviations for each of the two subscales in the Learning Self-Regulation Questionnaire (SQR-L) post-survey were represented by the participants’ group assignments and reported in Table 6.

Table 6

*Descriptive Statistics for Learning Self-Regulation Questionnaire (SQR-L) Post-survey based on Group Assignment (N=67)*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group eBook (n = 22)</th>
<th>Experimental Group eBook with audio (n = 20)</th>
<th>Control Group print book (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Motivation</td>
<td>M = 65.50 SD = 10.64</td>
<td>M = 71.65 SD = 9.14</td>
<td>M = 71.32 SD = 11.47</td>
</tr>
<tr>
<td>Controlled Motivation</td>
<td>M = 63.32 SD = 16.67</td>
<td>M = 74.35 SD = 11.63</td>
<td>M = 66.00 SD = 11.14</td>
</tr>
</tbody>
</table>

**Assumption Testing for Post-survey Scores**

Prior to conducting a MANOVA on Learning Self-Regulation Questionnaire (SQR-L) pre-survey results, assumption testing was completed to determine whether the following assumptions were admissible: sample size, normality, outliers, homogeneity of variance-covariance, linearity, and multicollinearity/singularity. For a MANOVA, there should be more cases in each cell than total dependent variables for the study.
For this study, the sample size assumption was satisfied by having at least 20 cases in each cell with only two dependent variables. The Shapiro-Wilk statistic was examined to check univariate normality. For this test, an alpha value greater than .05 indicates normality (Tabachnick & Fidell, 2007). Autonomous motivation was not normally distributed for the print book group \( p = .02 \) and eBook with audio group \( p = .05 \), but was normally distributed for the eBook group \( p = .12 \). Controlled motivation was normally distributed for each book format group \( p > .05 \).

Additional statistics were run to assess normality and univariate outliers where boxplots were examined. Boxplots revealed two outliers for the autonomous motivation scale within the print book and eBook groups. There was also an outlier detected in the controlled motivation scale within the print book group. The outliers were checked to ensure they were not the result of a recording error (Gall et. al., 2007). Since a MANOVA is tolerant of outliers if values are not too extreme and \( N > \) the number of dependent variables, the outliers were not removed (Tabachnick & Fidell, 2007). The outliers were modified by replacing the value with the next closest value which was not an outlier, but only slightly larger (Tabachnick & Fidell, 2007). A Mahalanobis distance statistic was calculated to examine multivariate outliers. The Mahalanobis distance values were assessed using two dependent variables, so the distance values were compared against a critical value of 13.82 to determine if there was a violation of this assumption within the data set (Tabachnick & Fidell, 2007). There were no violations of this assumption as the largest case number was 6.40 and was not larger than the critical value of 13.82, indicating a lack of multivariate outliers for this study. The assumption of homogeneity of variances was tenable, as assessed by Levene's test of homogeneity of
variance (autonomous motivation, \( p = .26 \); controlled motivation, \( p = .13 \)). The assumption of homogeneity of variance-covariance was tested using the Box’s M Test. There was homogeneity of variance-covariances matrices (\( p = .16 \)).

In order to determine if a linear relationship existed between dependent variables for each group, matrices of scatterplots was generated to check for linearity assumptions. As assessed using the scatterplots, there was a linear relationship between autonomous and controlled motivation. Pearson’s \( r \) correlations were conducted to examine multicollinearity among the dependent variables. There was no evidence of multicollinearity (\( r = .52, p < 0.001 \)), but there was a significant relationship suggested indicating a MANOVA was a suitable analysis (Tabachnick & Fidell, 2007).

A MANOVA was conducted on Learning Self-Regulation Questionnaire (SRQ-L) post-survey results using a significance level of .050. Pillai’s Trace was used to assess equality of group means as it was considered more powerful and robust than Wilks’ Lambda within multivariate analyses and presents the greatest protection against Type I errors when small sample sizes are present. (Tabachnick & Fidell, 2007). A statistically significant difference was found between the groups on the combined dependent variables, \( F(4, 128) = 2.73, p = .03 \); Pillai’s Trace = .16; partial \( \Phi^2 = .08 \), observed power .74. Therefore, I reject the following null hypothesis:

**H\(_0\)**: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the linear combination of the reading motivation scales as measured using the Learning Self-Regulation Questionnaire, while controlling for the pre-survey.
Because a statistically significant difference was found among groups on the combined dependent variables, follow-up univariate ANOVAs were ran. Univariate analyses of variance (ANOVAs) for each dependent variable were conducted as follow-up tests to the MANOVA. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each ANOVA was tested at a significance level of .025. Bonferroni is a common method used to control the familywise error rate. Bonferroni is often preferred because of its ease of use (Warner, 2013), but is considered conservative. However, Warner (2013) warned that using the Bonferroni method with an increased number of tests lowers the alpha level and leaves little chance of finding significance within a study. This study used a per-comparison alpha level of .05/2 which did not lower the level as much as using the method with three or more dependent variables. Warner (2013) suggested rendering Bonferroni less conservative by increasing the EW level to .10. Increasing the EW level within this study (.10/2) would have created the original alpha level of .050. Therefore, an alpha level of .025 was chosen for this study.

Using the adjusted significance level, neither ANOVA for autonomous reading motivation, $F(2, 64) = 2.37, p = .10$, nor controlled reading motivation were significant, $F(2, 64) = 3.87, p = .026$. There was no statistically significant difference found among groups in autonomous and controlled Learning Self-Regulation Questionnaire (SRQ-L) post-survey results using a significance level of .025. Therefore, I cannot reject the following null hypotheses:

$H_{02.1}$: College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the
autonomous motivation scale as measured using the Learning Self-regulation Questionnaire, while controlling for the pre-survey.

\( H_{02} \): College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the controlled motivation scale as measured using the Learning Self-Regulation Questionnaire, while controlling for the pre-survey.

**Summary**

The results of the data analyses displayed no statistically significant difference in reading comprehension between the experimental and control groups for this study. Based on the results, the research failed to reject the null hypothesis:

\( H_{01} \): College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in reading comprehension scores, as measured using a reading comprehension test, while controlling for the pretest.

The results of the data analysis indicated a statistically significant difference in autonomous and controlled reading motivation between the experimental and control groups for this study. Based on the results, the research rejected the following null hypothesis: \( H_{02} \): College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the linear combination of the reading motivation scales as measured using the Learning Self-Regulation Questionnaire, while controlling for the pre-survey.

Based on the significance found among groups in the linear combination of the reading motivation post-survey, univariate ANOVA’s were run on each dependent variable of autonomous and controlled motivation at an adjusted significance level of
0.25. Results of the data analysis indicated no statistically significant difference among groups and the research failed to reject the following null hypotheses:

**H_{0.1}:** College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the autonomous motivation scale as measured using the Learning Self-regulation Questionnaire, while controlling for the pre-survey.

**H_{0.2}:** College remedial reading students using an eBook, eBook with audio, and a print book will display no statistically significant differences in their mean scores for the controlled motivation scale as measured using the Learning Self-Regulation Questionnaire, while controlling for the pre-survey.

Chapter 5 begins with an overview of the study and a review of methodology. It includes a summary of the results of the analyses. In addition, the chapter will show the relationship between the current analyses results and prior research. Included in the Chapter 5 will be the theoretical and practical implications of the study, as well as assumptions and limitations. Chapter 5 will close with suggestions for future research and a summarizing conclusion.
CHAPTER FIVE: DISCUSSION

Introduction

Chapter 5 reviews the methodology for this quasi-experimental pretest-posttest non-equivalent control group design and provide a summary of the results from the analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) analyses. This chapter outlines the limitations, as well as the practical and theoretical implications of the research. Chapter 5 closes with recommendations for future research and a final summary.

The intent of this research was to determine if there was a statistically significant difference in the reading comprehension and reading motivation levels of post-secondary remedial reading students using an eBook or eBook with audio compared to students using a print book. There were two research questions examined in this study: (1) Is there a statistically significant difference in reading comprehension scores of remedial reading college students using an eBook, an eBook with audio, and a print book, while controlling for the pretest? (2) Is there a statistically significant difference in motivation levels of those college remedial reading students using an eBook and an eBook with audio compared to students using a print book, while controlling for the pre-survey?

Review of Methodology

A convenience sample of \((N = 67)\) post-secondary remedial reading students at a technical college in Northwest Georgia were randomly assigned to two experimental groups (eBook and eBook with audio) and one control group (print book). The reading comprehension pretest and the reading motivation questionnaire (SRQ-L) pre-survey
were given during the tenth week of the semester to both the control and experimental groups. The reading comprehension posttest and Learning Self-Regulation Questionnaire (SRQ-L) post-survey were given during the thirteenth week of the term after students read a module over Purpose and Tone in their assigned book format of either eBook, eBook with audio, or print book.

Control group students and experimental group students took the reading comprehension pretest online through Pearson’s MyReadingLab™ during the tenth week of the semester. According to Campbell and Stanley (1963), a pretest must be used as a baseline for evaluating participants as group selection was not random and groups may have had pre-existing differences. The analysis of variance (ANOVA) was used to determine if there was a statistically significant difference in reading comprehension pretest scores based on book format. After the pretest was administered, each group was asked to read a module over Purpose and Tone during the thirteenth week of the term. The control group, consisting of 25 students, read the module over Purpose and Tone in print book format. The experimental groups read the module over Purpose and Tone in eBook (22 students) and eBook with audio (20 students) format. As classes met twice per week, students read the module in their assigned book format during the first class meeting of the week and took the reading comprehension posttest online through Pearson’s MyReadingLab™ during the second class meeting of the week during the thirteenth week of the semester. Reading comprehension posttest scores were automatically determined by MyReadingLab™ in the form of raw scores. Results from the pretest indicated no significant difference between the three groups. Therefore, the pretest was not used as a covariate, and a one-way ANOVA was then conducted on
posttest results (Dimitrov & Rumrill, 2003). Results indicated no statistically significant difference in reading comprehension posttest scores among the eBook, eBook with audio, or print book groups.

Control group students and experimental group students also took the Learning Self-Regulation Questionnaire (SRQ-L) pre-survey by paper and pencil during the tenth week of the semester. A pre-survey was administered in order to establish a baseline for evaluating participants, as group selection was not random and groups may have had pre-existing differences. (Campbell & Stanley, 1963). Learning Self-Regulation Questionnaire (SRQ-L) pre-survey scores were manually calculated by the researcher and reported as raw scores for analysis. As there were two subscales within the Learning Self-Regulation Questionnaire (SRQ-L), a one-way multivariate analysis of variance (MANOVA) was used for analyzing the pre-survey scores to determine if there was a statistically significant difference in reading motivation pre-survey scores based on book format. There was a significant difference found in Learning Self-Regulation Questionnaire (SRQ-L) pre-survey scores in one of the dependent variables (controlled motivation) using a significance level of .050. Therefore, follow up univariate ANOVAs were run separately on the dependent variables of autonomous and controlled reading motivation using an adjusted alpha level of 0.25 as indicated by the Bonferroni method. Using the adjusted level of 0.25, there was no statistically significant difference found in Learning Self-Regulation Questionnaire (SRQ-L) pre-survey scores.

Both the control group and experimental group students took the Learning Self-Regulation Questionnaire (SRQ-L) post-survey by paper and pencil during the thirteenth week of the term. As classes met twice per week, students took the reading motivation
questionnaire (SRQ-L) post-survey during the second class meeting of the week. Learning Self-Regulation Questionnaire (SRQ-L) post-survey scores were manually calculated by the researcher and both the autonomous motivation and controlled motivation results were reported in the form of raw scores for analysis.

Based on pre-survey results, a MANOVA was run on Learning Self-Regulation Questionnaire (SRQ-L) post-survey results using a significance level of .050. Using Pillai’s Trace, a statistically significant difference between the groups on the combined dependent variables was found. Univariate analyses of variance (ANOVAs) for each dependent variable were conducted as follow-up tests to the MANOVA. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each ANOVA was tested at a significance level of .025. Using this adjusted significance level, no statistically significant difference was found among groups in autonomous and controlled Learning Self-Regulation Questionnaire (SRQ-L) post-survey results in the follow up tests. A MANOVA was then run on Learning Self-Regulation Questionnaire (SRQ-L) post-survey results without using the pre-survey scores as a covariate (Tabachnick & Fidell, 2007).

Prior to analysis, all data was tested to ensure conformity to the assumptions of sample size, normality, outliers, linearity, homogeneity of variance-covariance, singularity, and multicollinearity. There were no major concerns related to the violation of any assumptions.

Relationship to Prior Research

The purpose of this quasi-experimental pretest, posttest nonequivalent control group study was to ascertain if there was a statistically significant difference in the
reading comprehension levels of post-secondary remedial reading students using an eBook, eBook with audio, and a print book while controlling for the pretest. The study also sought to determine if there was a statistically significant difference in the reading motivation levels of post-secondary remedial reading students using an eBook, eBook with audio, and a print book while controlling for the reading motivation pre-survey.

Much research has determined reading comprehension and reading motivation levels in younger students using eBooks with audio, particularly in elementary students (Grimshaw et al., 2007). The current study supplements prior research by examining reading comprehension and motivation levels and the use of eBooks with audio from the perspective of a post-secondary student. It also studies a more diverse group through the assessment of remedial reading students.

Few studies have researched the use of eBooks with audio and their effect on reading comprehension or reading motivation. There has been only one study which investigated all three book formats (print book, eBook, and eBook with audio) and their effect on reading comprehension (Grimshaw et al., 2007). This study used only elementary students as participants. I found no secondary or post-secondary research which investigated all three book formats and their effect on reading comprehension or motivation. Research performed on elementary students included 81 participants ages 9-11. The study compared the effects of eBooks and eBooks with audio narration to print books. In comparing electronic books to print books, the study found that no statistically significant difference existed between students using print and electronic books without narration. While not statistically significant, the study did demonstrate those students reading from the eBook which utilized the audio narration feature showed an increase in
reading comprehension scores above the eBook or print book groups. Additionally, other studies have shown the benefits of using audio narrated books with struggling readers (Baskin & Harris, 1995; Bomar, 2006; Wilde & Larson, 2007). As there was significant research available regarding the benefits of eBooks with audio, study participants were comprised mainly of elementary-aged students. As prior research demonstrated that elementary students benefit from the use of eBooks with audio (Grimshaw et al., 2007), the current study also demonstrated an increase in reading comprehension scores with the use of eBooks with audio. However, this research investigated reading comprehension among post-secondary remedial reading students and no statistical significance was found among differing book format groups and the book format which was used. Findings may have been the result of the lack of students’ motivation to read, lack of reading comprehension skills, or students’ disinterest in the topic, as previous research has indicated (Lei, Bartlett, Gorney, & Herschbach, 2010). Prior research has also shown that using the audio features of an eReader were a low priority for college students, which may further justify the results found in the current study (Martinez-Estrada & Conway, 2010).

Early research has shown the relationship between reading comprehension and intrinsic motivation (Benware & Deci, 1984) in college students. A later study examined reading motivation (Montali & Lewandowski, 1996) using the bimodal presentation of visual and auditory channels concurrently to assess memory recall and reading comprehension. Participants in the study consisted of 18 average readers and 18 less proficient readers. Students were presented passages in three different formats on computers: visually (alone), auditorily (alone), and bimodally (both visually and
auditorily with the digital text highlighted while a voice narrated the test). Results of the study showed that the less proficient readers showed greater comprehension and stated they felt more successful and motivated. A more recent study determined that dyslexic teen-aged students using audiobooks displayed increased motivation and increase in reading accuracy (Milani, Lorusso, & Molteni, 2010). Research has shown how eBooks with audio have helped motivate and provide reading assistance for struggling readers at the elementary level (Cardillo, Coville, Ditlow, Myrick & Lesesne, 2007). The current research investigated the impact eBooks with audio had on reading motivation levels in post-secondary remedial reading students. As past research has also investigated this topic using struggling elementary-aged readers as participants, the current study expands the research by using post-secondary students as the research population. Results of the current study found no statistical significance in relation to book format and motivation. Findings in the current study may have been the consequence of students’ low intrinsic motivation scores which led to decreased self-motivation to read as stated by Starcher and Proffitt (2011). As the current study employed remedial reading students as participants, prior research (Guthrie & Davis, 2003) has shown that struggling readers often lack the motivation to read which may further explain results obtained in this study.

Theoretical Implications

The results of this research were examined using Paivo’s (1986) Dual-Code Theory, which was the basis of Mayer’s (2000) Cognitive Theory of Multimedia Learning (CTML). The current study revealed that delivering information both visually and verbally (eBook with audio) did not have a negative effect on reading comprehension as formally researched by both Paivio (1986) and Mayer and Anderson (1991). The
rationale for the Dual-Code and CTML theories suggest that using two representation
codes (visual and verbal) are better than one. Mayer and Moreno (2003) contended that
it’s as if the learner receives the material twice. Counter to this is Sweller’s (1994)
Cognitive Load Theory which stated delivering information in multiple representations
may actually cause a cognitive overload in a student’s brain. However, in only using the
two representation codes of visual and audio within this research, the Cognitive Load
Theory did not affect the study participants’ cognitive load. Because reading
comprehension scores were not significantly affected by book format, this study provided
no support that using two representation codes was superior to using only one
representation code (eBook or print book) as Mayer’s (2005) CTML suggested. The
study provided the need for further research using CTML, as reading comprehension
scores were not negatively affected when using an eBook with audio.

This study’s theoretical framework for reading motivation was based on Ryan and
Deci’s (2000) Self-Determination Theory (SDT). This theory was based upon intrinsic
and extrinsic motivation. These two motivations were represented in this study by
autonomous (intrinsic) and controlled (extrinsic) motivation found in the Learning Self-
Regulation Questionnaire (SRQ-L). Intrinsic motivation is the investigation of a person’s
innate behavior or self-motivation. Intrinsic motivation involves the performing of an
action, such as reading a book for pleasure, simply for self-gratification without the need
for reward (Deci, Vallerand, Pelletier, & Ryan, 1991). Extrinsic motivation involves the
performing of an action which does not involve the interest of the action, but involves a
reward as a consequence of the action. As reading motivation was not significantly
affected by book format, this study provided no support that using an eBook with audio
increased reading motivation in the areas of controlled (extrinsic) or autonomous
(intrinsic) motivation.

**Practical Implications**

The results of this research lead to implications for post-secondary remedial
reading students, as well as college professors and the general population of post-
secondary students. Although results indicated no statistically significant relationship
between reading comprehension and reading motivation levels based on book format,
results did show that using eBooks with audio may have a positive impact on reading
comprehension and reading motivation levels. This study indicated that post-secondary
remedial reading students using an eBook with audio scored higher in reading
comprehension and controlled reading motivation than students using an eBook or print
book.

After taking the reading motivation pretest and posttest, students in the eBook
with audio group were asked to answer a question on their Learning Self-Regulation
Questionnaire (SRQ-L) post-survey related to the sound of the audio narrator’s voice.
Students were asked if they found the narrator’s voice pleasing. Over 95% of the eBook
with audio group found the narrator’s voice pleasing. Results suggest that use of an
eBook with audio will not adversely affect students’ reading comprehension or
motivation levels based on the eBook’s audio features.

Results of this study also lead to implications for college professors. Given the
results of the current research, post-secondary students in the general population should
have the option to choose the text book format most suitable to them. As many college
textbooks offer a print or eBook version, college professors must give students a choice
based on results of this study. Not all eBooks offer audio narration as a supplement to the electronic text. However, software capable of converting text to speech is available for download. The results of this study provide statistical evidence that students comprehend text presented in an eBook with audio narration format in a manner superior to print books or eBooks alone. Based on results from the current study, students in the eBook with audio group showed an 11.8% - 12.5% increase in reading comprehension and a 12.7% - 17.4% increase in controlled reading motivation over eBook and print book groups.

**Limitations**

A quasi-experimental pretest, posttest non-equivalent control group design was used for this study. Book format groups were assigned based on students’ course selection and were not assigned by the researcher. A pretest, posttest design was used in order to control for threats to internal validity such as pre-existing group differences. According to Campbell and Stanley (1963), a pretest must be used as a baseline for evaluating the equality of participants’ knowledge of the instrument. Pretest results were analyzed for existing differences in book format groups prior to the implementation of the treatment and posttest.

The selection of the study’s participants, assignment of book format, and research setting must all be recognized as a limitation of this research. This study used a convenience sample of post-secondary remedial reading students as research participants and any remedial reading student returning a signed consent form was eligible to participate in the research. The results of this study can only be generalized to the current sample population of post-secondary remedial reading students and not to the general
population (Creswell, 2009). The research school was identified as a technical college located in Northwest Georgia. Approximately 2.5% of the students enrolled in this institution were enrolled in remedial reading. Students who scored below 77% on the reading portion of the ACT Compass® were asked to enroll in remedial reading in order to satisfy the institution’s requirements toward completing a degree, diploma, or certification. Results of this study may have differed using a general population sample without the segregation of participants identified as remedial reading students.

Because each student learns differently, many students enter college with a differing reading ability than that of their peers. A pretest of reading comprehension and pre-survey of reading motivation levels was administered in order to check for equivalency in comprehension scores and motivational levels among participants (Gall, Gall, & Borg, 2007). Likewise, participants may possess varying degrees of computer skills. As much of the instrumentation involves use of a computer, those participants using an eBook or eBook with audio within the conducted research were given a short tutorial on using this modality before data was collected.

The Learning Self-Regulation Questionnaire (SRQ-L) was completed by study participants in a self-report method. It was assumed participants’ responses genuinely reflected their level of reading motivation. In addition, another limitation of the self-report methodology may be the reliability and consistency of responses across the full range of reading motivation measurement (Fulmer, 2009).

The testing method itself was also considered a limitation of this study. The effect of giving the reading comprehension pretest prior to administering the posttest may affect the outcome of the results due to test experience (Dimitrov & Rumrill, 2003). An added
limitation was the fact that participants were only exposed to the eBook module over Purpose and Tone one time prior to the administration of the reading comprehension posttest. However, students were exposed to seven eBook modules before the pre and posttest were given based on topics other than Purpose and Tone. Likewise, administering the Learning Self-Regulation Questionnaire (SRQ-L) as a pre-survey may sensitize participants toward the topic of reading motivation and change their beliefs about that subject before taking the identical post-survey.

This study attempted to determine if reading comprehension and motivation levels of post-secondary remedial reading students were affected while using an eBook, eBook with audio, or print book while accurately representing the procedures and variables used in the research. It was the hope of this researcher that the methods used in this study provided a dependable and real-world measure of the reading comprehension and reading motivation levels of the research population.

**Recommendations for Future Research**

Completion of this study revealed several recommendations for future research. The literature review highlighted the need for additional studies regarding the use of eBooks with audio and their effect on reading comprehension and reading motivation at the post-secondary level. To further extend this recommendation, a study should be conducted using the general population of college students without segregating remedial reading students as participants. This research was necessary to determine if such a difference in reading comprehension and motivation exists among all college students. Additionally, using only one research institution limited the amount of participants in the study and a future study should include multiple institutions in order to provide a larger
sample size of participants. The review of literature also indicated that many college students preferred a printed textbook to an eBook. The current study did not address format preference among its participants and a question could be added to a future study to address this recommendation. In addition, this study may be further examined and data analyzed based on gender, race/ethnicity, and age.

To further add to the recommendation of preference, not all students in the current study were allowed to use eBooks with audio. Therefore, future research should include a study which simply addresses the preference of eBooks with audio and should not be conducted as a comparison study. Instead, it must address the idea that students prefer eBooks with audio because less reading is involved, and therefore it is suggested that future studies use a survey as the determining instrument.

This study used the online program MyReadingLab™ as the device for delivering the eBook. Future studies should not be limited to a single online program, but an actual college textbook delivered in an eBook with audio format should be used. Additional research must be conducted using an authentic electronic textbook in order to grasp the full scope of effects eBooks with audio have on reading comprehension and motivation levels.

As college students continue to be reliant on electronic devices for delivering information, statistical evidence for technological implementation will guide administrative decisions. The current research gives a small glimpse into the effect of eBooks with audio on reading comprehension and reading motivation levels in post-secondary students, but much research is needed to assist college professors and students in the best possible way to deliver information.
Summary and Conclusions

The purpose of this quasi-experimental pretest, posttest nonequivalent control group study was to determine the effect of eBooks with audio on the reading comprehension and motivation levels of post-secondary remedial reading students compared to students using eBooks or print books. Although results indicated there was not a statistically significant difference in reading comprehension scores based on book format, students in the experimental group using the eBook with audio displayed higher reading comprehension scores than the print book or eBook groups. Results provided statistical support that eBooks with audio increased reading comprehension scores in the research population’s remedial reading groups by 11.8% - 12.5% over the print book or eBook groups. Because reading comprehension difficulties lead to decreased reading engagement and decreased reading motivation, it was fundamental to understand what increases reading comprehension to ensure success for remedial reading students and thereby resulting in widespread effects for the research school’s remedial reading population. Because students in the eBook with audio group outperformed the print book and eBook groups, it suggested that remedial reading students at the research school may benefit from electronic books with audio narration. As the statistical results in this study show, using eBooks with audio in a post-secondary remedial reading classroom will not negatively affect reading comprehension.

Likewise, results indicated there was not a statistically significant difference in reading motivation scores based on book format and again students in the experimental group using the eBook with audio displayed an increase in controlled reading motivation over the print or eBook groups. Students in the experimental group of eBook with audio
displayed significantly different levels in the subscale of controlled reading motivation compared to students in the eBook or print book groups. Results showed a 12.7% - 17.4% increase in controlled reading motivation compared to students in the eBook and print book groups. Results presented statistical support for the research institution to use eBooks with audio among its remedial reading population, as evidenced by the increase in controlled motivation. As autonomous reading motivation shows an eagerness to read based on self-gratification, controlled reading motivation relies on a student’s eagerness to read based on reward or external/internal pressure (Ryan & Deci, 2000). While book format did not affect reading motivation for students’ autonomous motivation, the use of eBooks with audio did show an increase for students who do not read for self-gratification. As post-secondary remedial reading students may lack the motivation to read (Schugar, Schugar & Penny, 2011), the statistical analyses of this study suggests that using eBooks with audio may increase reading motivation in students who do not read for pleasure but for reward.

As post-secondary graduation rates continue to decline, the use of eBooks with audio may assist college remedial reading students with the reading comprehension skills and motivation necessary to succeed and complete a degree. These results, through statistical analyses, suggest that college professors should consider using eBooks with audio in the college classroom for post-secondary remedial reading students who may struggle to read or who may lack the motivation to read. This study indicated the use of eBooks with audio may present opportunities to develop reading comprehension and reading motivation in college students, as well as assist college professors by providing an alternate method for delivering information.
REFERENCES


Wells, C. (2012). Do students using electronic books display different reading comprehension and motivation levels than students using traditional print books (Doctoral dissertation). Retrieved from, School of Education, Digital Commons@Liberty University.


RE: Permission to Conduct Research Study

Dr. McCannon:

I am writing to request permission to conduct a research study at Georgia Northwestern Technical College. I am currently enrolled in the Ed.D. program of Curriculum and Instruction at Liberty University in Lynchburg, VA, and I am in the process of completing my dissertation. The study is entitled *Comprehension and Motivation Levels in Conjunction with the Use of eBooks with Audio: A Quasi-experimental Study of Post-Secondary Remedial Reading Students*. The implications of the research will assist reading instructors in designing the most effective instruction for their students.

As a former adjunct instructor at GNTC and a current faculty member of Georgia Highlands College, my hope is that Georgia Northwestern will allow me to use its remedial reading students as my study participants. I will only be using those remedial reading students enrolled in fall semester courses. Interested students who volunteer to participate will be given a consent form to be signed and returned to their instructor if they wish to take part in the study. The students will be assured of the anonymity of the data collected.

If approval is granted, student participants will be asked to complete a reading motivation survey in mid-October and again at the end of the semester. The survey process should take no longer than 10 minutes to complete. In addition, students will be asked to read a module over Purpose and Tone in one of 3 book formats (eBook, eBook with audio, and print). Students will be asked to take a 10 question comprehension assessment in MyReadingLab over Purpose and Tone after reading the module. Results of the survey and comprehension test will be pooled for dissertation analyses and individual results of the survey and test will remain absolutely confidential and anonymous. No costs will be incurred by either Georgia Northwestern Technical College or the individual participants.

Your approval to collect data for this study will be greatly appreciated. I have contacted Linda Mitchell through Karon Futch consented to the research
upon your approval. Please contact me if you have any questions regarding this study. I will be glad to immediately provide any documents you wish to preview. If consent to conduct research is granted, I would also appreciate a signed letter of permission on [redacted] letterhead acknowledging your consent and permission for me to conduct this study. I will be submitting this letter to the IRB for approval in August 2013.

Sincerely,

Kimberly W. Wheeler

[redacted]
Reading Coordinator and Instructor, Department of Academic Support
kwheeler@highlands.edu
Appendix B

CONSENT FORM

Comprehension and Motivation Levels in Conjunction with the Use of eBooks with Audio: A Quasi-experimental Study of Post-Secondary Remedial Reading Students

Kimberly W. Wheeler
Liberty University
School of Education

You are invited to be a part of a research study regarding the reading comprehension levels of remedial reading students while using eBooks and eBooks with audio. You were selected as a possible participant because you are a remedial reading student. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Kimberly W. Wheeler, Reading Coordinator/Instructor at [Redacted] and doctoral student at Liberty University’s School of Education.

Background Information:

The purpose of this study is to determine if there is a statistically significant difference in the reading comprehension scores and motivation levels of those post-secondary remedial reading students using an eBook and an eBook with audio compared to students using a print book?

Procedures:

If you agree to be in this study, I would ask you to do the following things:

- Answer several questions on a motivation scale at the beginning and end of the semester
- Read a three-page overview on Purpose and Tone in either print, eBook, or eBook with audio format
- Take a 10 question comprehension test

The motivation scale will take no longer than 10 minutes at the beginning and end of the semester. The three-page overview should take 20 minutes and the 10 question comprehension test should take no longer than 30 minutes.
Risks and Benefits of being in the Study:

The study has minimal risks and only includes the time it takes to complete the scale, overview, and test. The benefits are assisting future remedial reading students through the research results.

Compensation:

No compensation will be awarded.

Confidentiality:

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify you as a subject such as your name. Research records will be stored securely and only the researcher will have access to the records.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or Georgia Highlands College. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is Kimberly W. Wheeler. You may ask any questions you have now. If you have questions later, you are encouraged to contact Kim at kwheeler@highlands.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Suite 1837, Lynchburg, VA 24502 or email at irb@liberty.edu. You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature: ___________________________ Date: ____________

Signature of Investigator: ___________________________ Date: ____________
Appendix C

Reading Comprehension Test

Purpose and Tone Reading Skills: Post Test

Mona Lisa

1. Leonardo Da Vinci also goes far beyond surface realism in another masterpiece, the Mona Lisa of 1503 to 1505. So famous is this work, visited and photographed by millions upon millions of visitors to the Louvre Museum in Paris, that it has now been taken from its former position in one of the galleries and placed in a small house of its own, behind thick protective glass, and visible only for a few seconds when a light automatically goes on and off.

2. Yet what is all the shouting about? How do we account for the incredible stature of this relatively small canvas in the world of humanities? One reason, of course, may be that widely discussed mysterious smile. One does not find many smiles in portrait paintings, because the artist has customarily been hired to render both a realistic likeness and an idealization in the classical mode. The David of Michelangelo is a good example of a Renaissance work that is both an imitation of a real human being and a perfected version of what a human being should look like. Smiles particularize too much, so that Mona Lisa Giaconda, whom Leonardo was commissioned to paint, is not idealized womanhood but an individual woman captured in a particular inner action of a particular time.

3. If you look at the painting, however, you realize that the mouth is shown with only the faintest trace of a smile. Just as interesting is the fact Signora Giaconda is looking at something not shown in the painting-just what, we can never know. But this adds to the mystery. (Hint: If you’d like to leave behind a painting or a poem that people will still be talking about centuries from now, be sure there is an unsolvable mystery about it).

Questions:

1. What is the purpose of the passage?
   O A. to entertain the reader by belittling the Mona Lisa’s stature
   O B. to persuade the reader to appreciate the Mona Lisa
   O C. to explain the significance of the Mona Lisa in art history
   O D. to critique the artistic merit of the Mona Lisa
2. The phrases and sentences in parentheses serve to give this selection what kind of tone?

O A. smug
O B. ironic
O C. amusing
O D. silly

3. With the opening question of paragraph 2, the authors dare to suggest what?

O A. The fame of Mona Lisa may not be warranted
O B. The Mona Lisa has caused quite a lot of controversy
O C. They are based against the importance of the Mona Lisa
O D. Da Vinci was not as great an artist as Michelangelo

4. The authors mention Michelangelo’s David in order to

O A. show that smiles were common in classical art
O B. compare painting and sculpture as art forms
O C. contrast the Mona Lisa with a Renaissance work of art that is not highly individualized
O D. give an example of a work of art that is superior to the Mona Lisa

5. In the last paragraph, the authors mention Shakespeare in order to

O A. suggest that Shakespeare was inspired by Da Vinci
O B. underscore the importance of the theme of individualism in Renaissance art and literature
O C. suggest that the Mona Lisa was not a true example of individualism
O D. criticize Shakespeare’s character
Open Your Minds America

SAN ANTONIO, Texas – As people shout over each other and tune out diverging views in town hall meetings, the health care debate is proving to be symptomatic of a major ailment threatening our nation.

A contagious culture of closed-mindedness threatens to suffocate our progress as a society.

Why has it become so difficult to even consider changing our minds about important issues?

Here’s my diagnosis.

Increasingly, the willingness to change one’s position on political issues has been misread as a mark of weakness rather than a product of attentive listening and careful deliberation.

During the 2004 Presidential campaign, the successful branding of John Kerry as a flip-flopper doomed his bid. Fear of “flip-flopper syndrome” is apparently catching like the flu, because today’s politicians are not alone in their determination to adhere to partisan positions despite the changing needs of our nation.

Nearly everyone’s so reluctant to appeal wishy-washy that they stand firm even when the evidence is against their views.

Three factors exacerbate this paralysis by lack of analysis: labels, lifestyles and listening.

First, the labels ascribed to many potential policy tools render sensible options taboo, loading what could be rational, economic or social measures with moral baggage. This narrows our choices, hemming in policy makers.

Any proposal including the words “government-run” elicits cries of “socialism” and “communism.” Any argument invoking the words “God” or “moral” sparks accusations of “right-wing extremism,” “fascism,” or “Bible-thumping.” Instead of listening to each other’s ideas, we spot the warning label and run the other way.

Second, our lifestyles favor knee-jerk reactions. The way we think, work and live in the Digital Age demands we quickly categorize information without investing time into rich interaction, research and understanding.

We’re hesitant to ask questions because we don’t have time to listen to the long, complicated answers that might follow. And we lack the time to fact-check competing
claims. In our haste, it’s easier to echo our party’s position than drill down, questioning whether party leaders are motivated by our best interests or the best interests of their biggest contributors.

Third, we tend to listen only to like-minded opinions as media fragmentation encourages us to filter out varying perspectives. If you’re a liberal, you avoid FOX News. If you’re conservative you revile MSNBC. The dynamic is even more pronounced online, where a niche media source can be found for any outlook.

This silences the opportunity for meaningful dialogue and deliberation that might lead to reformulating positions, forging sustainable compromises, and developing consensus crucial to moving our nation forward on complex issues.

So how can we overcome this challenge, starting with the health care debate? How do we open our minds to the possibility that we could actually learn from somebody else?


Questions:

6. According to the article, why are politicians fearful of changing their opinions?

O A. They will be unfairly judged as weak “flip-floppers.”

O B. They will never be re-elected to office.

O C. They will be judged as too reasonable because of their partisan views.

O D. Congress will never adopt their new ideas.

7. What is the extended metaphor or comparison in this selection?

O A. liberals or conservatives

O B. politicians and right-wing extremism

O C. people who can’t make up their minds to politician John Kerry

O D. the health-care debate to an ailment or sickness
8. All the following words are used to extend a medical metaphor except?

O A. closed-mindedness
O B. diagnosis
O C. symptomatic
O D. contagious

9. What does the author say about people who refuse to change their minds on major issues?

O A. They are all flip-floppers like John Kerry.
O B. They are helping the nation to move forward on critical issues.
O C. Holding fast to an opinion even in the face of strong proof otherwise shows you are a strong candidate.
O D. They are preventing the nation from moving forward on critical issues.

10. What is the author’s tone in this article?

O A. enraged
O B. straightforward
O C. sympathetic
O D. frustrated
Answer Sheet

1. D
2. A
3. D
4. C
5. B
6. A
7. D
8. A
9. D
10. D
Appendix D

Comprehension Instrument Feedback Rubric

Please complete the following feedback rubric by placing an X in the YES or NO box as it applies to the following statements. Any statements which are marked NO, please give a brief explanation in the comments section provided below:

<table>
<thead>
<tr>
<th>Statement</th>
<th>YES, the passage or question meets the requirements of clarity, directness, and usefulness in evaluating variables contained in this quasi-experimental study</th>
<th>NO, the passage or question does not meet the requirements of clarity, directness, and usefulness in evaluating variables contained in this quasi-experimental study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The passage entitled “Mona Lisa”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Questions 1 - 5 will adequately test the comprehension of the passage entitled “Mona Lisa”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The passage entitled “Open Your Minds America”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Questions 6 - 10 will adequately test the comprehension of the passage entitled “Open Your Minds America”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Appendix E

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

October 8, 2013

Kimberly Wheeler
IRB Exemption 1689.100813: Comprehension and Motivation Levels in Conjunction with the Use of E-Books with Audio: A Quasi-Experimental Study of Post-Secondary Remedial Reading Students

Dear Kimberly,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and that no further IRB oversight is required.

Your study falls under exemption category 46.101 (b)(1, 2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:

1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
   (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.

Please note that this exemption only applies to your current research application, and that any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption, or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

[Redacted]

Fernando Garzon, Psy.D.
Professor, IRB Chair
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