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# The Enhancing Reading Comprehension Performance using the Strategy of Highlighting Electronic Text

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The Enhancing Reading Comprehension Performance using the Strategy of Highlighting  
Electronic Text

By

Christa Ann Ashbaugh, B. S.

Presented to the Faculty of the Graduate School of

Stephen F. Austin State University

In Partial Fulfillment

Of the Requirements

For the Degree of

Master of Arts

STEPHEN F. AUSTIN STATE UNIVERSITY

August 2018



The Enhancing Reading Comprehension Performance using the Strategy of Highlighting  
Electronic Text

By

Christa Ann Ashbaugh, B. S.

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## Abstract

Reading comprehension is a critical skill that an individual must utilize to navigate in the twenty-first century. This skill is developed throughout grade school and continues into adulthood. Many successful readers use active highlighting to assist in their reading comprehension. Active Highlighting is one of the most commonly used approaches to increase reading comprehension. Technology is ever growing and slowly replacing its paper-format counterparts. Educational settings are beginning to use this tool as a more efficient way to teach and test student's abilities. High-stake tests such as the SAT, are wanting to provide an online format for their exams. As technology continues to develop and replace paper-format text, it is critical to understand if there are any ramifications of using traditional reading comprehension strategies, such as highlighting material, in an electronic format. Thus, this study investigated if reading comprehension is improved when using the active reading comprehension strategy of highlighting. The study found that although highlighting did not impact the reading comprehension performance of all the individuals who participated, of those given the option to highlight or not, those who chose to highlight appeared to have higher reading comprehension performance.

Additionally, when highlighting was optional, those that choose to highlight scored higher on the task. This may indicate that the effectiveness of reading strategies depends more on the capacity and willingness to use the strategy.

*Keywords:* Reading Comprehension, Reading Strategies, Highlighting

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## Table of Contents

Abstract.....	i
Acknowledgement .....	ii
Table of Contents.....	iii
List of Tables .....	v
CHAPTER 1. INTRODUCTION.....	1
CHAPTER 2. LITERATURE REVIEW .....	3
Reading Comprehension.....	3
Mechanics of Reading Comprehension.....	4
Reading Comprehension Strategies.....	6
Highlighting as a Reading Strategy.....	8
Electronic Reading.....	10
Reading Comprehension and Electronic Text.....	14
Purpose and Hypotheses.....	15
CHAPTER 3.....	16
Pilot Study.....	16
Methods.....	17
Participants.....	17
Grouping.....	18
Measures.....	18
The Adult Reading History Questionnaire (ARHQ).....	18

Reading Comprehension SAT Passages and Questions.....	19
Time on Task.....	19
Procedure.....	19
CHAPTER 4. RESULTS .....	21
Preliminary Analysis.....	21
Demographics.....	21
Confounding Factors.....	23
Hypothesis 1.....	23
Hypothesis 2.....	23
Post-Hoc Questions.....	24
CHAPTER 5. DISCUSSION.....	25
Implications and Future Directions.....	28
Summary.....	29
References.....	31
Appendix A.....	40
Appendix B.....	47
Appendix C .....	48
VITA.....	56

## **List of Tables**

<b>Table 1:</b> Descriptive Statistic for the Final Sample.....	27
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## **Chapter I**

### **Introduction**

Reading comprehension skills are critical for determining when a person is college-ready. Reading comprehension is a complex skill that requires multiple reading mechanics working together simultaneously (Cain, Oakhill, & Bryant, 2004; Fuchs, Fuchs, Hosp, & Jenkins, 2001). Among those mechanics are language processes such as inferencing, scanning skills, vocabulary, decoding, and fluency (Moore, 2015; Cain et al., 2004). Furthermore, for some individuals reading comprehension involves the understanding of the ability to implement strategies (e.g., highlighting, note-taking, and rereading). In grade school, students are trained to use a variety of reading comprehension strategies, but in college students usually have a strong preference for one strategy (Dunlosky, Rawson, Marsh, Nathan, & Wilingham, 2013). The process of active highlighting is a technique that is very popular among college students (Moritz, Wilson, Kulovitz, & Wright, 2015). Compared to note-taking, for example, highlighting seems to be easier to use and less distracting (Kobayashi, 2007).

The twenty-first century has presented many advances including that of the digital age and the presence of technology in academic settings (Walsh, 2016). With these changes, students are now asked to demonstrate reading comprehension of electronic versions of articles, books, and magazines (Mangen, Walgermo, & Bronnick, 2013). However, most electronic versions of college-readiness tests (i.e. SAT, ACT) do not offer

the option for students to highlight. The purpose of this study is to determine if the reading comprehension strategy of highlighting enhances reading comprehension scores on electronic SAT sample reading tests. The main hypothesis of this study is that individuals asked to highlight the main ideas in an electronic text will score higher in reading comprehension than those that do not highlight. Another hypothesis of this study is that, when given the option, most individuals will not highlight electronic text.



## **Chapter II**

### **Literature Review**

#### **Reading Comprehension**

Robust reading skills are essential for an individual's educational and personal growth. Individuals with high reading abilities tend to perform well in academics, work, and social settings. To read well, one must be able to understand the information that is presented. The ability to comprehend written language is one of the many concepts, like mathematics, that must be mastered to excel in academics and everyday tasks (i.e., driving directions or professional emails). It is for this reason that one's capability to comprehend reading material may be considerably more significant in comparison to other learned skills (Mckee, 2012). This may be because if the student has an inefficient level of reading comprehension, the student might not be able to master other concepts or processes that impact the individual's educational and personal growth (Kissau & Hiller, 2013). For instance, in mathematics students are required to be able to read and comprehend complex word-problems to find the correct answer. Also, students must be able to understand written instructions in the science classroom in order to perform experiments successfully (Kissau & Hiller, 2013).

Reading comprehension is defined as “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (Shanahan, Callison, Carriere, Duke, Pearson, Schatschneider, & Torgesen, 2010, p.5).

Veeravagu, Muthusamy, Marimuthu, & Subrayan, (2010) identified that reading comprehension is a process that involves thinking about the language on the page and selecting information and ideas from the material that will help the reader understand the author's meaning behind the text. As a result, reading comprehension helps the reader draw conclusions pertaining to what is appropriate or valuable in the written text and shows what the reader must take away from the newly read information. Additionally, readers must be able to make a connection between current knowledge and new ideas that are obtained from the text. According to McLaughlin (2012), during the process of connecting old information and new information from the text, readers who have known the information longer have a better ability to make a connection between ideas written or inferred in the text. Therefore, for a student to have adequate reading comprehension he or she needs to learn and grasp new concepts presented in text format, to understand the information, and connect it to ideas that the reader has already been exposed.

### **Mechanics of Reading Comprehension**

Reading comprehension contains many components that must work together for a reader to understand the material. Successful comprehension includes complex concepts; In order to understand how reading comprehension works, one must understand each contributing factor (Moore, 2015). A number of theories and models tend to focus on separate aspects of reading such as the identification of component skills or the identification of various processes (Kendeou, McMaster, & Christ, 2016). For example, Tighe and Schatschneiders' (2016) used a meta-analysis to identify the essential components of reading skills in reading comprehension. In this study, components that

were identified as essential include morphological awareness, fluency, oral vocabulary knowledge, working memory, language comprehension, and real-world knowledge. Findings also suggested that components including pseudoword decoding, orthographic knowledge, and phonological awareness had only a moderate relationship with reading comprehension.

In comparison, Meneghetti, Carretti, and De Beni (2006) examined the relationship between 10 different components of reading comprehension and scholastic achievement. The study also aimed to understand the relationship of scholastic success from the “complex” and “basic” aspects of reading comprehension that are better predictors of scholastic success. The 10 different aspects of reading comprehension that the study measured were: 1. characters, times and events; 2. events and sequences; 3. syntactic structure; 4. connections between parts of the text; 5. inferences; 6. text sensitivity; 7. text hierarchy; 8. mental model; 9. text flexibility; and 10. errors and inconsistencies. The findings suggest that “complex” aspects (6. text sensitivity; 7. text hierarchy; 8. mental model; 9. text flexibility; and 10. errors and inconsistencies) of reading comprehension are better predictors of scholastic achievement.

Reading comprehension is not only a linguistic skill but also a general cognitive skill (Mckee, 2012). At the college level, for instance, in order to demonstrate a good reading comprehension skill the reader must use prior knowledge; understand the text structure; predict, preview, and question the text while familiarizing themselves with word meanings (Haenggi, & Perfetti, 1994). At that level, the person must also be able to

make inferences that relate to the information within passages and identify the primary significance of the text that has been read (Randi, Grigorenko, & Sternberg, 2005).

### **Reading Comprehension Strategies**

Instruction on reading comprehension begins early and is taught throughout elementary grade levels. However, as the student goes through intermediate and secondary grades, reading comprehension becomes the primary focus of reading instruction within the classroom (Paris & Hamilton., 2009). In the primary grades, students learn about phonics, word identification, and other literacy skills so that they are capable of identifying words. This stage consists of the student understanding what the word is more than focusing on the meaning of the word because readers need to be able to read the words on the page initially. In the intermediate grades and on, it is assumed that the reader is capable of word identification to read the words on the page, thus allowing the focus to be on comprehension (Allington, 2001). The skill of being able to read for the sake of learning is considered the ability to understand or comprehend text (Moore, 2015).

In a grade school setting, children are often introduced to strategies to promote successful reading comprehension. Educators often use these reading strategies to facilitate improvement in reading comprehension so that students will benefit from reading the required texts (Mckee, 2012). McLaughlin (2012), for example, suggested that strategies such as summarization, inference, or prediction are important to be implemented to assist children in better comprehension of text material. Klingner, Urack, Golos, Brownell, and Menon (2010) reports that teachers who introduce more strategies

to their students have better outcomes in regards to reading comprehension skills.

Furthermore, they found that activities used to help students with reading comprehension development were characterized by teachers asking more questions about the readings.

Extensive research has been done on techniques that can be used in the classroom to aid students in reading comprehension. Mariotti (2010), for instance, reviewed five different brief reading comprehension strategies that could be used in the classroom for reading comprehension strategies. These strategies include (1) giving background to the reading material and making an effort to connect the reading to students' prior knowledge, also known as "prepared questions"; (2) providing a strong vocabulary program, referred to as "word connection"; (3) setting aside blocked opportunity for the student to be able to do reading and writing in the classroom, called "call to mind"; (4) giving the students time to discuss the readings, known as "ABC brainstorming"; and (5) incorporating teacher-directed instruction and modeling of reading/ thinking strategies, known as "Think aloud".

Similarly, Ko, and Hughes' (2015) examined the reading comprehension instruction in secondary special education classrooms in the United States. Findings showed that teachers implemented many reading comprehension practices. The most frequently observed practices included reading aloud, questioning, seat-work, activating prior knowledge, and using graphic organizers. Explicit instruction on how and when to use reading comprehension strategies, however, was not observed in the study. This study revealed the extent to which evidence-based reading comprehension practices are not

making their way into special education classrooms because teachers are not provided proper training or preparation

In a more specific study, Kissau and Hiller (2013) examined which reading comprehension strategy is viewed as most beneficial. Additionally, the study examined and compared the teaching methods of educators in both Germany and the United States. The findings suggested that there was a universal preference among the participants of both countries and for specific reading comprehension strategies. It was also suggested that some strategies might be more beneficial in certain areas than others. However, it also shows that while there is a wide variety of ways that reading comprehension strategies are often taught in the classroom, students have specific preferences for one strategy.

**Highlighting as a Reading Strategy.** Skilled readers have been observed to use multiple reading techniques to increase their reading comprehension. Skilled readers often reread the unfamiliar parts of the text, take notes, and underline or highlight parts of the text (Gier, Kreiner, Hudneel, Montoya &Herring, 2011). A study by Taraban, Rynearson, and Kerr (2000) found that college students understand the importance of using reading comprehension strategies. In the study, students with higher GPAs and ACT scores reported using more reading comprehension strategies than students with lower ACT and GPA scores. Highlighting parts of the text that appear to be relevant was reported frequently among higher-level readers (Gier et al., 2010).

The common use of highlighting may be due to “convenience and apparent ease” (Metzger & Fuson- Newsome, 2016). Van Blerkom, Van Blerkom, and Bertsch (2006)

determined that the act of highlighting produced better recall than other study techniques that are popular when reading the material or studying for a test. The ability to accurately identify valuable information is a skill needed to decrease the amount of information that needs to be retained, which in turn, assists in better reading comprehension. In comparison, if the reader cannot identify important information within the text, the reader's comprehension is hindered.

The poor reader may highlight too much or too little content within the text (Dunlosky et al., 2013; Fuson- Newsome & Metzer, 2016; Yang, 2006). For example, Yue, Storm, Kornell, and Bjork (2014) assessed the possible benefits of highlighting as well as individual differences in the use of highlighting and explored effects of highlighting in relation to the distributed study and metacognitive beliefs about highlighting as a study tool. The study found that an overall benefit occurred when highlighting was used as a tool. However, the benefit was only related to students who preferred highlighting.

Fowler and Barker (1974) examined the effectiveness of highlighting selected text for improving retention of the material. The purpose of the study was to determine (a) if highlighting is effective as a retention aid, (b) if active participation in the highlighting task enhances the presumed beneficial effect, (c) the degree of agreement among students reading educational material for the first time in regards to which part of the text is important, and (d) the relationship between the proportion of material chosen for emphasis and retention. The results of this study indicate that highlighting does improve

retention of selected text material and active highlighting is better compared to the passive reading of the highlighted material.

However, Marxen (1996) states that if the reader is only highlighting what he or she believes to be significant, the reader may ignore the majority of the material and therefore have a worse comprehension. More recently, Hartley, Barlett and Branthwaite (2014) conducted a metaanalysis on highlighting text as an effective reading comprehension strategy. The authors found that few studies, if any, provide clear-cut support for the effectiveness of underlining; that a limited number of methods of testing recall have been used; and that little is known of how students that benefit from highlighting. This opposing view indicated that active highlighting may have negative consequences if the reader does not highlight the relevant information in the text or does not know what information is relevant on the text. Therefore, while some researchers found that highlighting improved reading comprehension, more recent studies support the idea that highlighting text may only improve reading comprehension under certain conditions.

### **Electronic Reading**

Education from elementary school to the university level has influenced the use of the medium. The influence education has had on literature, and the legacy of the print culture is due to students of the past having little to no opportunities to access any format other than print (Durant & Horava, 2015). When the reader is reading from a paper format, he or she can focus on a single section of a page without getting lost in the rest of the text located on the page. The individual can also turn the page physically, which



presents a somewhat foot-print mentality of the location of the material that has been read (Jabr, 2013). With these processes, including creating a rhythm of reading, it becomes apparent that a person can easily navigate when reading in the paper format, and also helps create a coherent mental map of the text that was read (Jabr, 2013).

However, since the digital age, there has been a shift in the way the reading material is presented. There has been an immense increase in digital devices that can be used for reading material online. These devices include but are not limited to: computers, laptops, e-books, tablet devices, and smartphones (Mangen et al., 2013). With the continuous availability of electronic information, students (especially young individuals) are reading from a screen rather than paper to learn and comprehend new information (Mangen et al., 2013; Walsh, 2016). Since 2014, it has been reported that 63% of colleges are using e-textbooks and 27% of colleges have reported that they plan to use e-textbooks in the future; this also includes an increase in tablet use within schools as early as elementary school (Niccoli, 2015).

The College Board, the maker of the SATs, has been increasingly moving from pencil and paper to computer screens to administer the SAT since 2017. In the fall and spring of the 2016-2017 school year that more than 5,000 students in 17 school districts took the online version of the SAT (Gewertz, 2018). The online SAT is currently serving more than 10 states and about 250 school districts. The SAT's shift to the online format is due to the Partnership for Assessment of Readiness for College and Careers (PARCC) and Smarter Balanced exams that are required in over 20 states, where nearly all the students take the exams via an online format. In addition, since 2017, all tests that are in

the National Assessment of Educational Progress, are provided online (Gewertz, 2017). The SAT is also following the footsteps of their rival, ACT Inc. The ACT has increasingly been offering the exam on electronic formats for over the past three years. In 2016-2017 it is reported that nearly 82,000 of the 1 million students who took that exam that year, took the exam online (Gewertz, 2018). Continuous advances and changes in both the platform and tools of the electronic reading format make it difficult for findings on the subject to remain relevant. Each time the electronic format significantly changes, new studies must be conducted to understand its effects on reading comprehension when compared to the traditional paper format. Understanding the implications of these changes is imperative to teaching more effective reading comprehension strategies to students (Niccoli, 2015; Walsh, 2016).

The theoretical and pedagogical implications of the ongoing digitization of reading material on reading comprehension are complex. A vast number of questions remain to be addressed completely or even partially (Mangen et al., 2013). Questions such as: “To what extent might comprehension be different in linear, narrative, and non-narrative text formats when the display of the text is printed on paper in comparison to on screen-based formats?”, and “Are student’s reading comprehension skills impacted in educational subjects when presented on computer screens instead of presented in a printed textbook?”(Walsh, 2016) Not enough research has been done to understand and compare the effects of electronic documents to printed documents on reading comprehension.

A study by Kerr and Symons (2006) examined if reading rate, comprehension, and recall of children are affected by computer presentation of text. The findings indicated that the children read the text more slowly on the computers than on paper and that they recalled more information when they read using the computer format than the paper format. However, when reading from the paper format, the participants were more efficient at the comprehension of the passages. These findings suggest that “while children, if given enough time, may be able to comprehend equal amounts of information from paper and computer, when reading time is accounted for, children are comprehending less efficiently when reading from computers” (Kerr & Symon, 2006, pp. 13-14). A similar result was found by Mangen et al. (2013) which examined the effects of a technological interface on reading comprehension in a Norwegian school setting. The main findings in this study demonstrated that the participants reading printed text scored significantly better on their reading comprehension tests than as those reading in the PDF format on the computer.

A study by Wastlund, Reinikka, Norlander, and Archer (2005) consisted of two different experiments to compare production (writing), comprehension performance, and text presentation. Results suggest that in both experiments the condition of the computer presentation is mediocre in comparison to the condition of the paper presentation in writing and reading comprehension. The participants also noted that they felt higher levels of stress and tiredness while reading the Portable Document Format (PDF) in comparison to those reading the paper format. Wastlund and his colleagues concluded

that reading and working on a computer results in a higher cognitive workload than that of paper.

### **Reading Comprehension and Electronic Text.**

In regards to reading, electronic formats of books and text are now preferred by college students (Walsh, 2016). However, many students still print online documents when they feel they require greater in-depth understanding or better reading comprehension (Chou, 2012; Tuncer & Bahadir, 2014; Walsh, 2016). Student preferences may be due to the majority of academic photocopies that are scanned into the computer rather than appropriately formatted for electronic consumption (Rose, 2011). College students' preference for print text over electronic text when studying difficult materials is supported by the literature. Studies such as Niccoli (2015), shows that those who read the passage on paper tend to have higher scores for multiple-choice recall as well as short answers than those that read on electronic versions.

One reason why student may prefer paper format for difficult readings is that they have the ability to easily mark up the documents (i.e., highlight). Therefore, Stoop et al. (2013) and Rockinson- Szapkiw, Courduff, Carter, and Bennett (2013), suggest that there is potential to provide an experience of engagement and interaction with the document electronically. Software technology such as PDF document- functions (i.e., the ability to annotation and markup tools or note-taking functions that require expertise and knowledge of the user), technology-based alternatives may be of value to standardized testing (Walsh, 2016).

## **Purpose and Hypotheses**

Students must have good reading comprehension skills to be successful in college. Another component of a student's education is the platform on which the material is presented. The purpose of this study is to examine if a traditional reading comprehension strategy (i.e., highlighting) helps individual reading comprehension when texts are presented electronically. Specifically, the aim of this study is to examine if forcing active highlighting improves the reading comprehension of electronic text. In this study, individuals from the general population with a reading level of high school were asked to answer questions about four passages while required to highlight, not allowed to highlight, or given the option to highlight the most important ideas. It was hypothesized that those required to highlight will score higher than those not allowed to highlight. However, when given the option, most individuals will choose not to highlight electronic text.

## **Chapter III**

### **Pilot Study**

To determine whether the instructions, text used, and highlighting targets were adequate, a pilot phase was conducted before conducting the primary study. A total of seven participants were recruited to participate in the pilot study. All seven participants were female graduate psychology students attending Stephen F. Austin State University. Participants in the pilot phase were asked to complete five SAT reading comprehension passages and multiple-choice questions for each passage. This was followed by a short questionnaire that asked how old the participant is, how difficult each passage was for the participant to read, and how well he or she understood the instructions.

The pilot study participants reported different levels of difficulty for the passages and labeled them from very easy to very hard. Overall, the highlighted main ideas in each passage were similar across all participants. The average completion time of the task was about 34 minutes and the fastest completion time in the pilot study was 14 minutes and 40 seconds. The majority (71.43%) reported that instructions were easy to understand. Quantitatively, participants reported that five paragraphs seemed too long and they had difficulty remembering the instructions for identifying the main ideas. To reflect these qualitative findings, one passage (passage five) was removed from the main study, and the same directions were given before each of the passages. See Appendix A for passages

given during the pilot study, including the most highlighted ideas and the questionnaire used to determine difficulty levels and clearness of instructions.

## **Methods**

### **Participants**

A total of 406 individuals were recruited nation-wide through Mechanical Turk and were randomly placed in three conditions (required to highlight, given the option to highlight, and not allowed to highlight). Mechanical Turk is a service from Amazon where one can complete simple tasks in exchange for a payment. According to Paolacci and Chandler (2014), Mechanical Turk has become a popular source for survey and experimental data. It is a labor market online where the employers or requesters recruit employees, also called workers, to complete Human Intelligence Tasks (called HITs) in exchange for a reward (i.e., a small wage).

To be included in the study, the participants were required to have at least a high school education, or an equivalent to a high school diploma (e.g., GED) and no more than of a bachelor's degree and be older than 17 years and younger than 61 years of age. Exclusionary factors for this study include English Language Learners and residing outside of the United States. Also, based on the results of the pilot study and the recommended time of completion of each SAT passage (Fracchia, 2016), participants were excluded if they completed all the passages in less than 15 minutes. A total of 133 participants were excluded from the study because they completed the task under 15 minutes. The total number of participants in this study that data was taken from was 133.

The study was approved by the SFASU Institutional Review Board (IRB) refer to Appendix B.

### **Grouping**

Participants were randomly assigned to one of the following three conditions:

1. *Required to highlight the material (N = 42, 31.6%)*: Participants in the first condition, required to highlight, were instructed that they must highlight important information in order to receive credit for participation.

2. *Given the option to highlight the material (N = 51, 38.3%)*: The second condition, where the individuals were given the option to highlight was instructed that they had the choice to highlight the important information if they wish to so but were not required to do so.

3. *Unable to highlight material (N = 40, 30.1%)*: The third condition, is where participants were instructed just to read the passages and answer the questions. This condition made it difficult for the individual to highlight information on their own through the program and it was stated that if highlighting is done on the program, they would not receive credit.

### **Measures**

**The Adult Reading History Questionnaire (ARHQ)** is a self-report questionnaire that is designed to measure any risk of reading disability in adults. The questionnaire asks the individual about their own history and current habits of reading in order to estimate the risk that they have reading difficulties. Lefly and Pennington (2000) found that ARHQ is both a reliable and valid tool. The ARHQ consists of 23 questions



pertaining to the individual's reading habits, reading history when they were learning to read, and comprehension ability on daily tasks. The questions are based on a five-point Likert scale. ARHQ Questions can be found in Appendix C.

**Reading Comprehension SAT Passages and Questions:** One of the most well-known and used standardized tests in the world is the SAT. The SAT's main purpose is to measure a student's academic ability for success in college (Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008). A total of four passages from an SAT practice test website was chosen for participants to read. Each reading comprehension passage was followed by multiple choice questions that assess the individual's ability to understand the passage and what is implied. The passages are at a college level. The passages range from 400-900 words and have 7 to 12 reading comprehension questions each. The scores were collected by finding the total number of correct answers for all four passages combined.

### **Time on Task**

Time on task was measured in minutes from the time the participant clicked into the activity to the time they clicked submit for a total time of completion of the whole study. A setting on Qualtrics gave this measurement automatically once the survey was submitted.

### **Procedure**

After attaining the participants' informed consent, participants were directed to the Qualtrics survey. Qualtrics is an online survey-based platform tool that allows researchers to create, build, distribute, and analyze electronic surveys. The database survey tool builds the database and records the completed responses as they are

completed. A URL link can be generated in order for the survey to be accessed by participants (Angriawan, Connors, Furdek, & Ruth, 2012). Every participant read a total of four passages, followed by multiple choice reading comprehension questions. Each participant in the required to highlight group was instructed that they must highlight the main ideas in order to receive credit for participation. Each participant in the optional highlighting group was instructed that they may highlight the main ideas if they wished to do so. Participants were instructed to use the mouse cursor to highlight the main ideas on their computer screen. The third group was told to pay close attention to the main idea. After completion of the reading comprehension passages, participants completed the Adult Reading History Questionnaire and a brief demographic questionnaire. Finally, participants were debriefed regarding the reason and the importance of their participation in the study. After the participants' completion, participants were compensated \$1.50 for their participation in the study.

## Chapter IV

### Results

#### Preliminary analyses

Prior to analyses, the dependent variable: the comprehension score was examined for accuracy, missing values, and normality. No missing values were found All values were inside the Interquartile range (IQR) and thus, there were no outliers. The distribution of the comprehension score appeared to be in the normal range, skewness ( $z = 0.67, SE = 0.21$ ) and kurtosis ( $z = -0.36, SE = 0.41$ ).

#### Demographics

A frequency analysis was conducted to describe the age, gender, and ethnicity of the final sample. The sample's average age was 33.21 ( $sd = 10.88$ ). As can be seen in Table 1, the sample had an equal proportion of males and females and was composed mostly of Caucasian and Asian Americans. The majority of participants (73.7%) had obtained a Bachelor's degree as their highest level of education. It is important to note that comprehension scores positively correlated with age ( $r = .41, p < .001$ ) and negatively correlated with education ( $r = -.13, p = .050$ ) suggesting that contrary than expected, higher age and lower education seems to relate to higher reading comprehension.

**Table 1** Descriptive statistics for the final sample (N=133)

Variable		N	Percentage
Gender	Female	62	46.6%
	Male	71	53.4%
Education Level	High School	21	15.8%
	Associate Degree	14	10.5%
	Bachelors' Degree	98	73.7%
Ethnicity	Caucasian	68	51.1%
	Black or African American	12	9.0%
	American Indian or Alaska Native	10	7.5%
	Asian	41	30.8%
	Other	2	.16%
Has Taken SAT Before	Yes	68	51.5%
	No	56	42.1%
	Maybe	9	6.8%

## **Confounding Factors**

Before testing the first hypothesis, potential confounding factors were evaluated to determine if the assigned groups differed on *education level*, *time on task* or *ARHQ* scores. One-way ANOVAs showed that there were no significant difference between on any of the potential confounding factors, education level ( $M= .95$ ,  $sd= 0.51$ ),  $F(2,130) = .50$ ,  $p= .639$ , time on task ( $M= 34.05$ ,  $sd= 12.72$ ),  $F(2,130) = .69$ ,  $p= .502$ , or ARHQ scores ( $M=0.40$ ,  $sd=0.18$ ),  $F(2,130) = 1.26$ ,  $p= .286$ .

## **Hypothesis 1**

Hypothesis 1 was tested determining if the groups scored significantly different on the comprehension task. The one-way ANOVA demonstrated no significant differences between the groups, required highlighting ( $M=13.8$ ,  $sd= 6.59$ ), optional highlighting ( $M=12.22$ ,  $sd= 5.25$ ), and no highlighting ( $M=13.18$ ,  $sd= 5.85$ ) and performance on comprehension task ( $M= 13.0$ ,  $sd= 5.89$ ), and  $F(2,130) = .84$ ,  $p= .431$ . A T-test demonstrated that those that highlighted the main ideas correctly scored higher in the comprehension tasks ( $M=16.6$ ,  $sd= 5.64$ ) than those that did not highlight the main ideas correctly ( $M= 11.9$ ,  $sd= 5.82$ ).

## **Hypothesis 2**

A chi-squared analysis was conducted to determine if, within *Group 2 (optional highlighting)*, there was a significantly lower proportion of individuals that chose to highlight the text. Results indicated that out of the 51 participants in *Group 2*, the majority of participants chose *not to highlight* ( $N = 33$ ; 65%). These frequencies were significantly different,  $X^2(1, N=51) = 4.41$ ,  $p= .036$ .

## Post-Hoc Analyses

To determine if choosing to highlight vs. choosing not to highlight plays a role in comprehension, an independent sample t-test was used to determine if there were statistically different scores between participants that chose *to highlight* ( $N=18$ ) versus participants that chose *not to highlight* in *Group 2* ( $N=33$ ). Mean scores that chose to highlight ( $M=14.33$ ,  $sd= 5.04$ ), were significantly different than those that chose not to highlight ( $M=11.06$ ,  $sd=5.09$ ),  $t(49) = 2.21$ ,  $p=.032$ ,  $d=0.65$ .

Given that there was a significant difference found optional highlighting in group 2, an independent sample t-test was run to determine whether Education Level, Time on Task, AHRQ was different between among the participants that chose to highlight and choose not to highlight. Education Level was not significantly different than those that highlighted ( $M= .83$ ,  $sd=.71$ ) and those that did not highlight ( $M= 1.09$ ,  $sd=.52$ ),  $t(49) = 1.48$ ,  $p= .65$ ). Mean score on Time on task for those that chose to highlight ( $M=31.49$ ,  $sd=11.83$ ) was significantly lower than those that chose not to highlight ( $M= 33.77$ ,  $sd=12.22$ ),  $t(49) = .64$ ,  $p= .55$ . The mean AHRQ score for those who chose to highlight ( $M=.36$ ,  $sd= .18$ ) was not significantly higher than those who chose not to highlight ( $M=.46$ ,  $sd=.20$ ),  $t(49) = .1710$ ,  $p=.75$ .

## **Chapter V**

### **Discussion**

The purpose of this study was to examine if the use of active highlighting could be beneficial to reading comprehension performance in online formats. The results did not support the first hypothesis of this study. This study found no statistically significant difference among groups on reading comprehension by showing that individuals in the highlighting group did not have better scores in comparison than those that were required to highlight. The current study supports findings by Fowler and Baker (1974), Hartley, Bartlett and Branthwaite (2014), and Marxen (1996), which indicates that underlining text only makes a difference in reading comprehension when certain conditions are met. The study found support for the second hypothesis in that there are fewer individuals that choose to highlight electronic text when given the option. This finding suggests that individuals did not feel comfortable highlighting electronic text when given the option.

Interestingly, when given the option to highlight (Group 2), individuals that did highlight appeared to perform better on the reading comprehension passages than those that did not highlight. Also, those that highlighted the main ideas correctly had better reading comparison scores compared to those that incorrectly highlighted the main ideas. This is supported by Marxen (1996) that if the reader is only highlighting what they believe to be important, the reader may ignore the majority of the material and therefore have a worse comprehension. It is also possible that individuals who choose to highlight

the main ideas tend to regularly use highlighting when reading (Gier et al., 2011; Taraban et al., 2000; Yue et al., 2014). Motivation may also explain the results. Kirmizi (2011) findings suggest that individuals that are highly motivated, like to use strategies that assist in their ability to understand texts, use these strategies more regularly, and put more effort to when reading. Although not significant, individuals that were given the option to highlight (Group 2) spent less time on the task than those that chose not to highlight. Therefore, it is possible that highlighting is not directly causing better comprehension but instead, individuals that chose to highlight tended to have better general reading skills (Mandinach, Bridgeman, Cahalan-Laitusis, & Trapani, 2005).

According to Taraban et al., (2000), individuals with higher GPAs and ACT scores report using more reading strategies. The results of the current study did not reflect those with higher education had better reading comprehension scores. However, opposite than expected, in the current study, those with higher age and lower education scored higher on the comprehension tasks; finding that does not seem to be supported by the literature. In addition, it appeared that that the older aged participants were more conscientious of completing the task correctly. Unfortunately, this study failed to ask questions that could have further explained these unexpected results. For example, the current study could have asked for the participants' major, current student status, the time they spend reading, or if they usually highlight as they read or use any reading strategies on a routine basis. Also, identifying how long a participant has practiced using underlining to aide in reading comprehension would have increased our understanding of the current results (Yang, 2006).



There are a number of other limitations that impact the generalizability of the study. The current study found that a very high number of participants (62.4%) reported elevated scores on the ARHQ suggesting the possibility of having a reading disability. This number is not expected for the general population, and it is believed to be based on limitations in the recruitment method and materials used in the study. Although the ARHQ is a self-report survey suggested to be a reliable and valid tool (Lefly and Pennington, 2000), it is possible that the participants in this study underestimated their reading abilities. The self- perception of the reader's abilities is normally formed prior to the occasion in which the assessments are done and are believed to be worse than what they actually are (Kwon and Linderholm, 2014).

There were also limitations associated with using Mechanical Turk as the recruitment method for obtaining participants. Some of the limitations of this study are that Mechanical Turk's demographics are not similar to those of the general public, as seen in the current study. Paolacci and Chandler (2014) stated that people who are on Mechanical Turk usually are individuals that are younger, overeducated, and underemployed. In addition, Asian populations are overly represented in the program as Blacks and Hispanics are underrepresented in comparison to the general population (Paolacci & Chandler, 2014). ESL was controlled with a setting on Mechanical Turk, however, the researcher does not know if English was the participant's first language. A one-way ANOVA looked at comprehension performance and ethnicity showed that the Asian-American participants ( $M=8.8$ ) scored lower compared to the other ethnicities: White ( $M= 15.8$ ), Black or African American ( $M=13.3$ ), American Indian or Alaska

Native ( $M=8.9$ ), Native Hawaiian ( $M=22$ ), and Other ( $M=26$ ). Another limitation is that due to the nature of online research, there was no way to make sure that the participants put in the effort that they should have to complete the task to their full ability. Desoto (2016) noted that some Mechanical Turk Workers have admitted to even completing tasks at their jobs or while they are doing other daily activities.

The study also had an uneven sample size of varying highest education levels. Participants with a High School Diploma as their highest level of education were the minority, compared to the other groups. Paolacci et al. (2014) found that the education level of the U.S. workers on Mechanical Turk are higher than those of the general populations, as a vast majority of the individuals have a bachelor's degree. This aspect of the study influenced the findings because the SAT passages are targeted to individuals about to enter college and individuals with bachelor's degrees should be able to read at a higher reading level than the reading level found in the SAT passages.

### **Implications and Future Directions:**

The College Board (the maker of the SAT and the ACT) is making the shift from paper-based testing to computer-based testing. In addition, approximately 40 states, by the end of the 2014-2015 school year, implemented an online assessment for their students instead of a paper format (Murphy, 2015). According to Boevé, Meijer, Albers, Beetsma, and Bosker (2015), computer-based exams have multiple advantages and the shift to online accessibility for higher education is slowly adapting. In addition, the SAT is trying to keep up with other high-stake exams such as the PARCC and Smarter Balanced exams, which is offered online (Gewertz, 2018). According to Yang (2018),

Digital testing will provide lower costs, give instant results, and provide more accurate scoring.

Therefore, identifying reading comprehension strategies that can be used during electronic tests similar to that offered in the paper-format can potentially impact the student's performance. For example, highlighting electronic text could possibly be integrated into standardized tests, such as the SAT or ACT and be user-friendly.

Thompson and Larriva (2018), noted that in the year 2018, the ACT and SAT would start to be offered online with the ability to highlight passages. However, there is little to no research or data stating the user-friendly ability of this new function and the implications for online testing.

Like the current study, future studies may try to identify and test electronic format friendly strategies that can improve reading comprehension. Additionally, future studies may focus on how reading comprehension strategies such as highlighting can help individuals with learning disabilities different than adequate readers. Future research may also focus on recent high school graduates or identify platforms that better capture the SAT target population. Another factor that future research should consider is analyzing how reading strategies are used by individuals with different interests and backgrounds (e.g., English v. Mathematics enthusiastic), and how these strategies, in turn, influence reading comprehension.

## **Summary**

In summary, the purpose of this study was to examine if traditional reading comprehension strategy (i.e., highlighting) increases reading comprehension when texts

are electronically given. Specifically, this study aimed to explore the effects of active highlighting electronic text on college-level reading comprehension. This study found that individuals that chose to highlight when given the option perform better than those who did not. This finding is useful information because it shows that if the individual takes advantage of the option to actively highlight as they read, their reading comprehension is better. These results in combination with future studies have the potential to help us understand the effects of reading strategies on reading comprehension tasks completed in electronic formats.

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*Appendix A: Pilot: Highlighted Passages and Questionnaire*

**Passage 1**

The pioneers of the teaching of science imagined that its introduction into education would remove the conventionality, artificiality, and backward-lookingness which were characteristic; of classical studies, but they were gravely disappointed. So, too, in their time had the humanists thought that the study of the classical authors in the original would banish at once the dull pedantry and superstition of mediaeval scholasticism. The professional schoolmaster was a match for both of them and has almost managed to make the understanding of chemical reactions as dull and as dogmatic an affair as the reading of Virgil's Aeneid.

The chief claim for the use of science in education is that it teaches a child something about the actual universe in which he is living, in making him acquainted with the results of scientific discovery, and at the same time teaches him how to think logically and inductively by studying scientific method. A certain limited success has been reached in the first of these aims, but practically none at all in the second. Those privileged members of the community who have been through a secondary or public-school education may be expected to know something about the elementary physics and chemistry of a hundred years ago, but they probably know hardly more than any bright boy can pick up from an interest in wireless or scientific hobbies out of school hours.

As to the learning of scientific method, the whole thing is palpably a farce. Actually, for the convenience of teachers and the requirements of the examination system, it is necessary that the pupils not only do not learn scientific method but learn precisely the reverse, that is, to believe exactly what they are told and to reproduce it when asked, whether it seems nonsense to them or not. The way in which educated people respond to such quackeries as spiritualism or astrology, not to say more dangerous ones such as racial theories or currency myths, shows that fifty years of education in the method of science in Britain or Germany has produced no visible effect whatever.

The only way of learning the method of science is the long and bitter way of personal experience, and, until the educational or social systems are altered to make this possible, the best we can expect is the production of a minority of people who are able to

acquire some of the techniques of science and a still smaller minority who are able to use and develop them.

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## Passage 2

By the time a child is six or seven, she has all the essential avoidances well enough by heart to be trusted with the care of a younger child. And she also develops a number of simple techniques. She learns to weave firm square balls from palm leaves, to make pinwheels of palm leaves or frangipani blossoms, to climb a coconut tree by walking up the trunk on flexible little feet, to break open a coconut with one firm well-directed blow of a knife as long as she is tall, to play a number of group games and sing the songs which go with them, to tidy the house by picking up the litter on the stony floor, to bring water from the sea, to spread out the copra to dry and to help gather it in when rain threatens, to go to a neighboring house and bring back a lighted faggot for the chief's pipe or the cook-house fire. But in the case of the little girls, all these tasks are merely supplementary to the main business of baby-tending.

Very small boys also have some care of the younger children, but at eight or nine years of age, they are usually relieved of it. Whatever rough edges have not been smoothed off by this responsibility for younger children are worn off by their contact with older boys. For little boys are admitted to interesting and important activities only so long as their behavior is circumspect and helpful. Where small girls are brusquely pushed aside, small boys will be patiently tolerated, and they become adept at making themselves useful. The four or five little boys who all wish to assist at the important, business of helping a grown youth lasso reef eel, organize themselves into a highly efficient working team; one boy holds the bait, another holds an extra lasso, others spoke eagerly about in holes in the reef looking for prey, while still another tucks the captured eels into his lava-lava.

The small girls, burdened with heavy babies or the care of little swaggerers' who are too small to adventure on the reef, discouraged by the hostility of the small boys and the scorn of the older ones, have little opportunity for learning the more adventurous forms of work and play. So while the little boys first undergo the chastening effects of baby-tending and then have many opportunities to learn effective cooperation under the supervision of older boys, the girls' education is less comprehensive. They have a high standard of individual responsibility, but the community provides them with no lessons in cooperation with one another. This is particularly apparent in the activities of young people: the boys organize quickly; the girls waste hours in bickering, innocent of any technique for quick and efficient cooperation.

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## Passage 3

That large animals require a luxuriant vegetation, has been a general assumption which has passed from one work to another; but I do not hesitate to say that it is completely false and that it has vitiated the reasoning of geologists on some points of great interest in the ancient history of the world. The prejudice has probably been derived from India, and the Indian islands, where troops of elephants, noble forests, and impenetrable jungles, are associated together in everyone's mind. If, however, we refer to any work of travels through the southern parts of Africa, we shall find allusions in almost every page either to the desert character of the country or to the numbers of large animals inhabiting it. The same thing is rendered evident by the many engravings which have been published of various parts of the interior.

Dr. Andrew Smith, who has lately succeeded in passing the Tropic of Capricorn, informs me that, taking into consideration the whole of the southern part of Africa, there can be no doubt of its being a sterile country. On the southern coasts there are some fine forests, but with these exceptions, the traveler may pass for days together through open plains, covered by a poor and scanty vegetation. Now, if we look to the animals inhabiting these wide plains, we shall find their numbers extraordinarily great, and their bulk immense. We must enumerate the elephant, three species of rhinoceros, the hippopotamus, the giraffe, the boss caffer, two zebras, two guns, and several antelopes even larger than these latter animals. It may be supposed that although the species are numerous, the individuals of each kind are few. By the kindness of Dr. Smith, I am enabled to show that the case is very different. He informs me, that in lat. 24', in one day's march with the bullock-wagons, he saw, without wandering to any great distance on either side, between one hundred and one hundred and fifty rhinoceroses - the same day he saw several herds of giraffes, amounting together to nearly a hundred. At the distance of a little more than one hour's march from their place of encampment on the previous night, his party actually killed at one spot eight hippopotamuses, and saw many more. In this same river there were likewise crocodiles. Of course it was a case quite extraordinary, to see so many great animals crowded together, but it evidently proves that they must exist in great numbers. Dr. Smith describes the country passed through that day, as 'being thinly covered with grass, and bushes about four feet high, and still more thinly with mimosa-trees.'

Besides these large animals, everyone the least acquainted with the natural history of the Cape, has read of the herds of antelopes, which can be compared only with the flocks of migratory birds. The numbers indeed of the lion, panther, and hyena, and the multitude of birds of prey, plainly speak of the abundance of the smaller quadrupeds: one evening seven lions were counted at the same time prowling round Dr. Smith's encampment. As this able naturalist remarked to me, the carnage each day in Southern Africa must indeed be terrific! I confess it is truly surprising how such a number of animals can find support in a country producing so little food. The larger quadrupeds no doubt roam over wide tracts in search of it; and their food chiefly consists of underwood, which probably contains much nutriment in a small bulk. Dr. Smith also informs me that the vegetation



has a rapid growth; no sooner is a part consumed, than its place is supplied by a fresh stock. There can be no doubt, however, that our ideas respecting the apparent amount of food necessary for the support of large quadrupeds are much exaggerated.

The belief that where large quadrupeds exist, the vegetation must necessarily be luxuriant, is the more remarkable, because the converse is far from true. Mr. Burchell observed to me that when entering Brazil, nothing struck him more forcibly than the splendor of the South American vegetation contrasted with that of South Africa, together with the absence of all large quadrupeds. In his Travels, he has suggested that the comparison of the respective weights (if there were sufficient data) of an equal number of the largest herbivorous quadrupeds of each country would be extremely curious. If we take on the one side, the elephants hippopotamus, giraffe, bos caffer, elan, five species of rhinoceros; and on the American side, two tapirs, the guanaco, three deer, the vicuna, peccari, capybara (after which we must choose from the monkeys to complete the number), and then place these two groups alongside each other it is not easy to conceive ranks more disproportionate in size. After the above facts, we are compelled to conclude, against anterior probability, that among the mammalia there exists no close relation between the bulk of the species, and the quantity of the vegetation, in the countries which they inhabit.

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#### **Passage 4**

The Ring at Casterbridge was merely the local name of one of the finest Roman amphitheatres, if not the very finest remaining in Britain.

Casterbridge announced old Rome in every street, alley, and precinct. It looked Roman, bespoke the art of Rome, concealed dead men of Rome. It was impossible to dig more than a foot or two deep about the town fields and gardens without coming upon some tall soldier or other of the Empire, who had laid there in his silent unobtrusive rest for a space of fifteen hundred years. He was mostly found lying on his side, in an oval scoop in the chalk, like a chicken in its shell; his knees drawn up to his chest; sometimes with the remains of his spear against his arm; a brooch of bronze on his breast or forehead; an urn at his knees, a jar at his throat, a bottle at his mouth; and mystified conjecture pouring down upon him from the eyes of Casterbridge street boys, who had turned a moment to gaze at the familiar spectacle as they passed by.

Imaginative inhabitants, who would have felt an unpleasantness at the discovery of a comparatively modern skeleton in their gardens, were quite unmoved by these hoary shapes. They had lived so long ago, their time was so unlike the present, their hopes and motives were so widely removed from ours, that between them and the living there seemed to stretch a gulf too wide for even a spirit to pass.

The Amphitheatre was a huge circular enclosure, with a notch at opposite extremities of its diameter north and south. It was to Casterbridge what the ruined Coliseum is to modern Rome, and was nearly of the same magnitude. The dusk

of evening was the proper hour at which a true impression of this suggestive place could be received. Standing in the middle of the arena at that time there by degrees became apparent its real vastness, which a cursory view from the summit at noon-day was apt to obscure. Melancholy, impressive, lonely, yet accessible from every part of the town, the historic circle was the frequent spot for appointments of a furtive kind. Intrigues were arranged there; tentative meetings were there experimented after divisions and feuds. But one kind of appointment - in itself the most common of any - seldom had place in the Amphitheatre: that of happy lovers.

Why, seeing that it was pre-eminently an airy, accessible, and sequestered spot for interviews, the cheerfullest form of those occurrences never took kindly to the soil of the ruin, would be a curious inquiry. Perhaps it was because its associations had about them something sinister. Its history proved that. Apart from the sanguinary nature of the games originally played therein, such incidents attached to its past as these: that for scores of years the town-gallows had stood at one corner; that in 1705 a woman who had murdered her husband was half-strangled and then burnt there in the presence of ten thousand spectators. Tradition reports that at a certain stage of the burning her heart burst and leapt out of her body, to the terror of them all, and that not one of those ten thousand people ever cared particularly for hot roast after that. In addition to these old tragedies, pugilistic encounters almost to the death had come off down to recent dates in that secluded arena, entirely invisible to the outside world save by climbing to the top of the enclosure, which few townspeople in the daily round of their lives ever took the trouble to do. So that, though close to the turnpike-road, crimes might be perpetrated there unseen at mid-day.

Some boys had latterly tried to impart gaiety to the ruin by using the central arena as a cricket-ground. But the game usually languished for the aforesaid reason - the dismal privacy which the earthen circle enforced, shutting out every appreciative passer's vision, every commendatory remark from outsiders - everything, except the sky; and to play at games in such circumstances was like acting to an empty house. Possibly, too, the boys were timid, for some old people said that at certain moments in the summer time, in broad daylight, persons sitting with a book or dozing in the arena had, on lifting their eyes, beheld the slopes lined with a gazing legion of Hadrian's soldiery as if watching the gladiatorial combat; and had heard the roar of their excited voices; that the scene would remain but a moment, like a lightning flash, and then disappear.

Henchard had chosen this spot as being the safest from observation which he could think of for meeting his long-lost wife, and at the same time as one easily to be found by a stranger after nightfall. As Mayor of the town, with a reputation to keep up, he could not invite her to come to his house till some definite course had been decided.

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### Passage 5

Mr. Harding was not a happy man as he walked down the palace pathway, and stepped out into the close. His position and pleasant house were a second time gone from

him; but that he could endure. He had been schooled and insulted by a man young enough to be his son; but that he could put up with. He could even draw from the very injuries which had been inflicted on him some of that consolation which, we may believe, martyrs always receive from the injustice of their own sufferings. He had admitted to his daughter that he wanted the comfort of his old home, and yet he could have returned to his lodgings in the High Street, if not with exultation, at least with satisfaction, had that been all. But the venom of the chaplain's harangue had worked into his blood, and sapped the life of his sweet contentment.

'New men are carrying out new measures, and are carting away the useless rubbish of past centuries!' What cruel words these had been- and how often are they now used with all the heartless cruelty of a Slope! A man is sufficiently condemned if it can only be shown that either in politics or religion he does not belong to some new school established within the last score of years. He may then regard himself as rubbish and expect to be carted away.

A man is nothing now unless he has within him a full appreciation of the new era; an era in which it would seem that neither honesty nor truth is very desirable, but in which success is the only touchstone of merit. We must laugh at everything that is established. Let the joke be ever so bad, ever so untrue to the real principles of joking; nevertheless, we must laugh - or else beware the cart. We must talk, think, and live up to the spirit of the times, or else we are naught. New men and new measures, long credit and few scruples, great success or wonderful ruin, such are now the tastes of Englishmen who know how to live!

Alas, alas! Under such circumstances Mr. Harding could not but feel that he was an Englishman who did not know how to live. This new doctrine of Mr. Slope and the rubbish cart sadly disturbed his equanimity. 'The same thing is going on throughout the whole country!' 'Work is now required from every man who receives wages!' And had he been living all his life receiving wages, and doing no work? Had he in truth so lived as to be now in his old age justly reckoned as rubbish fit only to be hidden away in some huge dust-hole? The school of men to whom he professes to belong, the Grantlys, the Gwynnes, are afflicted with no such self-accusations as these which troubled Mr. Harding. They, as a rule, are as satisfied with the wisdom and propriety of their own conduct as can be any Mr. Slope, or any Bishop with his own.

But, unfortunately for himself, Mr. Harding had little of this self-reliance. When he heard himself designated as rubbish by the Slopes of the world, he had no other resource than to make inquiry within his own bosom as to the truth of the designation. Alas, alas! the evidence seemed generally to go against him.

What is your gender?

- Male
- Female
- Other

---

How old are you?

---

Please rate the difficulty of each passage you read.

	Easy	Quite Easy	Neither	Quite Hard	Hard	Very Hard
Passage 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Passage 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Passage 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Passage 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Passage 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Were the instructions easy to understand?

- Yes
- No

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Any other comments?

Appendix B: IRB Approval Letter



STEPHEN F. AUSTIN STATE UNIVERSITY

Institutional Review Board for the Protection of Human Subjects in Research  
P.O. Box 13019, SFA Station • Nacogdoches, Texas 75962-3046  
Phone (936) 468-1153 • Fax (936) 468-1573

Principal Investigators: Luis E. Aguerrevere  
Human Services  
P. O. Box 13019 SFA Station  
Nacogdoches, Texas 75965

Co-investigators: Frankie Clark, Christa Ashbaum

RE: Project Title " The Effects of Electronic Text Presentation and Traditional Reading Comprehension Strategy on reading Comprehension performance" Case # AY2018-1246

TYPE OF RESEARCH: Thesis

FROM: Robert Polewan, IRB-H

A handwritten signature in black ink, appearing to read 'Robert Polewan', written over a diagonal line.

DATE: July 9, 2018

I would like to thank you for submitting your project entitled "The Effects of Electronic Text Presentation and Traditional Reading Comprehension Strategy on reading Comprehension performance" to the IRB for review. It has been reviewed and has been **Approved**, based on the following review criteria:

CFR §46.101(b)(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.

Your project has approval through **July 9, 2019**, should you need additional time to complete the study you will need to apply for an extension prior to that date. The IRB should be notified of any planned changes in the procedures during the approval period, as additional review will be required by the IRB, prior to implementing any changes, except when changes are necessary to eliminate immediate hazards to the research participants. The researcher is also responsible for promptly notifying the IRB of any unanticipated or adverse events involving risk or harm to participants or others as a result of the research.

All future correspondence regarding this project should include the case number **AY2018-1246**.

*Appendix C: The Adult Reading History Questionnaire (ARHQ)*

Sex:  Male  Female

**Above Average**                      **Average**                      **Below Average**

1. How would you compare your current reading speed to that of others of the same age and education?

                      

**A great deal**                      **Some**                      **None**

2. How much reading do you do in conjunction with your work (if retired or not working, how much did you read

when you were  
working?)

**None**

**Some**

**A great  
deal**

3. How much difficulty  
did you have learning to  
spell in elementary  
school?



**Above  
Average**

**Average**

**Below  
Average**

4. How would you  
compare your current  
spelling to that of others  
of the same age and  
education?



**No**

**Talked  
about it,  
but didn't  
do it**

**Repeated  
1 grade**

**Repeated 2  
grades**

**Dropped  
out**

5. Did your parents ever consider having you repeat any grades in school due to academic failure (not illness)?

No

A Great Deal

6. Do you ever have difficulty remembering people's names or names of places

7. Do you have difficulty remembering addresses, phone numbers, or dates?

8. Do you have difficulty remembering complex verbal instructions?



9. Do you currently  
reverse the order of  
letters or numbers when  
you read or write?

<b>More than 10</b>	<b>6-10</b>	<b>2-5</b>	<b>1-2</b>	<b>None</b>
---------------------	-------------	------------	------------	-------------

10. How many books do  
you read for pleasure  
each year?

<b>5 or More</b>	<b>3-4</b>	<b>1-2</b>	<b>1-2</b>	<b>None</b>
	<b>Regularly</b>	<b>Regularly</b>	<b>Irregularly</b>	

11. How many  
magazines do you read  
for pleasure each  
month?

<b>Everyday</b>	<b>Once a</b>	<b>Once in a</b>	<b>Rarely</b>	<b>Never</b>
	<b>Week</b>	<b>While</b>		

12. Do you read daily  
(Monday-Friday)  
newspapers?

<b>Completely</b>	<b>Scan each</b>	<b>Once in a</b>	<b>Rarely</b>	<b>Never</b>
<b>Every</b>	<b>week</b>	<b>while</b>		
<b>Sunday</b>				

13. Do you read a  
newspaper on Sunday?

<b>Loved</b>	<b>Hated</b>
<b>School;</b>	<b>School;</b>
<b>Favorite</b>	<b>Tried to</b>
<b>activity</b>	<b>get out of</b>
	<b>going</b>

14. Which of the  
following most nearly  
describes your attitude  
toward school when you  
were a child

	<b>None</b>				<b>A great Deal</b>
--	-------------	--	--	--	---------------------

15. How much difficulty did you have learning to read in elementary school?

                  

	<b>No help</b>	<b>Help from friends</b>	<b>Help from teachers/parents</b>	<b>Tutors or special class 1 year</b>	<b>Tutor or special class 2+ years</b>
--	----------------	--------------------------	-----------------------------------	---------------------------------------	--

16. How much extra help did you need when learning to read in elementary school?

                  

	<b>No</b>				<b>A Great Deal</b>
--	-----------	--	--	--	---------------------

17. Did you ever reverse the order of

letters or numbers when  
you were a child?

18. Did you have  
difficulty learning letter  
and/or color names  
when you were a child?

**Above  
Average**

**Average**

**Below  
Average**

19. How would you  
compare your reading  
skill to that of others in  
your elementary  
classes?

**Not at all**

**Less than  
most**

**About the  
same**

**More than  
most**

**Much more  
than most**

20. All students struggle  
from time to time in  
school. Compared to  
others in your classes,

how much did you  
struggle to complete  
your work?

**No; enjoyed  
and did well**

**Some**

**A Great  
Deal; did  
poorly**

21. Did you experience  
difficulty in high school  
or college English  
classes?



**Very  
positive**

**Very  
negative**

22. What is your current  
attitude toward reading?



**A Great Deal**

**Some**

**None**

23. How much reading  
do you do for pleasure?





## VITA

After graduating from Edward S. Marcus High School in 2011, Christa completed her Bachelors of Science in Psychology with a minor in Child Development and Family Studies. During her time as an undergraduate, she volunteered as a Research Assistant at the Sensation, Affect, Cognitive, and Knowledge Laboratory under the supervision of Dr. Steven Estrada, where she began to get first-hand experience with research. She was accepted into the School Psychology Master's program in the Fall of 2015. Currently, Christa is studying at Stephen F. Austin State University where she seeks a Masters of Arts in School Psychology.

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Style manual designation: American Psychological Association – modified in order to meet graduate school requirements

This thesis was typed by Christa Ashbaugh