

EIGHTH GRADERS' READINGS OF PAPER AND COMPUTER SCREEN STORIES:
A CASE STUDY OF ONE CLASSROOM

by

Amanda Habermehl

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Department of
Language, Learning and Leadership
State University of New York at Fredonia
Fredonia, New York

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EIGHTH GRADERS' READINGS

State University of New York at Fredonia
Department of Education

CERTIFICATION OF PROJECT WORK

We, the undersigned, certify that this project entitled EIGHTH GRADERS' READINGS OF PAPER AND COMPUTER SCREEN STORIES: A CASE STUDY OF ONE CLASSROOM by Amanda R. Habermehl, Candidate for the Degree of Master of Science in Education, Literacy Education Birth-Grade 6, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.



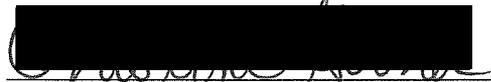
Masters Project Advisor, EDU 659
Dr. Clara Beier
Department of Language, Learning and Leadership

5-8-2012
Date



Department Chair
Dr. Anna Thibodeau
Department of Language, Learning and Leadership

5-9-2012
Date



Dean Christine Givner
College of Education
At SUNY Fredonia

5/24/12
Date

Abstract

This case study explored how three eighth grade students comprehended four chapters from the short story, *Hooch*. The study investigated how their comprehension of *Hooch* varied when reading from paper versus a computer screen. It also investigated how their experience with technology affected their ability to comprehend digitally-presented text. Data were collected through the number of ideas retold and how many comprehension questions were correctly answered for each chapter. In addition, the three participants were interviewed about their experience and preference of reading from paper or computer screen. Students were able to comprehend the most when reading a chapter from the computer. In addition, a student's experience with technology did not affect how the student comprehended a digitally presented text. Results of the study suggest that the integration of digitally-presented text into classrooms may benefit the students' ability to comprehend what they read, though future research needs to be carried out to ensure that similar results are found among a larger group of participants. Results of the study also suggest the importance of teachers providing technological experience to students in order to equip the students for the future digital world.

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EIGHTH GRADERS' READINGS

Chapter 1

It is Friday afternoon, and the eighth grade students in a private Catholic school classroom know what time it is: independent reading time. One by one, the students retrieve their reading materials and nestle into their seats. Some students pull out paperback books, one retrieves her nook, and another pulls a book up on the classroom iPod touch. Each student has their preference of reading medium. How these reading materials will affect classrooms of the future is yet to come.

How reading from a computer screen or paper affects one's ability to comprehend information is the focus of this research study. Today's technology offers numerous options for reading and gaining information. Young people often read using technology devices. This study investigated ways these devices affected students' comprehension and also whether, or not, students' personal experiences with digital text affected their comprehension.

Background

Technology is improving at a rapid pace. People of all ages utilize the most up-to-date computers, iPods, iPads, eBooks, and phones in their daily routines. Even in education, teachers are encouraged to integrate technology in the classroom. In 2011, the International Society for Technology in Education (ISTE) developed standards for students to meet in order to become technologically literate. These standards include utilizing technology in creativity and innovation, communication and collaboration, research and information fluency, and critical thinking and problem solving. In addition, the Common Core Standards, which were recently adopted by most states, require students to utilize technology while reading and writing.

This topic was selected for two reasons. First, it was selected due to the increase of technology in classrooms. Second, the national and state emphasis on improving reading

comprehension among students had increased. This topic was inspired by an observation a peer in the SUNY Fredonia's Graduate Literacy Program made of her clinic student. She wondered whether her student's reading ability and comprehension changed depending on the reading media used.

The terminology essential to understanding the study includes *Digital Literacy*, *Technology Fluency*, *Open Door Students*, and *the Matthew Effect*. *Digital Literacy* refers to being literate in technology (Judson, 2009). This includes how to approach and find information on digital devices and the Internet. When people are digitally literate, they are able to easily pursue information on the Internet. Similarly, *Technological Fluency* occurs when one has “depth and breadth of technological aptitudes and abilities in a variety of areas such as databases, telecommunications, and multimedia presentations” (p. 272). In other words, they are proficient and well-rounded in technology. *Open Door Students* are those “whose technology competence leads to successful academic achievement” (p. 272). Since these students are proficient in technology, their familiarity with technology tools and their background experience assist them in their core subject learning. They are able to use their knowledge of technology to assist them in studying and learning. *The Matthew Effect* (Hasselbring & Goin, 2004) refers to proficient readers who improve over time; however, those who struggle in reading fall further behind as time continues. This can be a result of students not receiving the appropriate instruction necessary to improve. Yet, today, it can also be a result of students not having access to technology.

Theoretical Stance

My literacy philosophy includes more than one view. First, I adopted a constructivist philosophy. According to Tracey and Morrow (2006), “Constructivism is a theory of learning

that emphasizes the active construction of knowledge by individuals” (p. 47). I encourage inquiry learning, a constructivist approach, in my teaching so students may own their learning experience. Inquiry learning stems from John Dewey (1859-1952). He encouraged active learners who would eventually become involved citizens who form opinions and make decisions. He “emphasized the growth of the individual, the importance of the environment, and the role of the teacher in students’ learning” (p. 49). Technology plays a vital role in inquiry learning as students utilize the computer to pursue their own learning.

In addition, I believe that authentic, meaningful text is crucial to a reading curriculum. Text today can include paper text and digital text. According to Donald L. Leu (1999), literacy has expanded, and teachers need to utilize both paper and digital reading material. Utilizing both in the classroom produces well-rounded reading habits among students.

I feel that mature and fluent readers must maintain a metacognitive stance while interacting with text in order to monitor their comprehension. Also, I believe that readers should be equipped with strategies to detect and overcome comprehension difficulties in order to promote independence in their reading. Encouraging students’ awareness of their ability to comprehend paper and digital text will equip them for the future digital age.

In addition to constructivism, I hold a social learning perspective as well. I integrate literature circles in my classroom in order to encourage students to take ownership in their reading. Literature circles relate to the socio-cultural theory, which states that social interactions strongly affect how one approaches reading and writing. Therefore, a student’s previous social associations influence his approach and familiarity to digital text. In addition, I support the critical literacy theory, which encourages readers to be aware of the social and political ties to

literacy. In other words, as critical readers, students are aware of the possible connections and biased views presented by authors, whether on paper or in digital text.

My theoretical stance guided my interest in how students comprehend material presented on a computer screen. A primary tool used in inquiry learning today is technology. I wanted to know how well students comprehended what they were reading on a computer screen when inquiring about a topic. In addition, my stance on social learning includes the use of technology. Therefore, whether students are able to participate in social learning via technology depends on their ability to read material on a computer screen. Most importantly, many of my students use the computer to read material. In order to read material with a critical mindset, the students must understand the material first. Therefore, the importance of comprehending texts on a computer screen is supported by my personal theoretical stance.

The increased amount of technology utilized in school classrooms guided the rationale behind this research. Educators are encouraged to integrate a variety of technology into instruction and to increase technology literacy among students. In addition, many students find interest in technology and may learn better via technology-based activities. Therefore, it is possible that students find reading information on a computer screen easier to comprehend than traditional paper texts. Previous studies focused on the relationship between technological literacy, student comprehension, and learning (Kerr & Symons, 2006; Pao-Nan & Hsi-Chi, 2010). These findings provided direction for this mixed study of an eighth grade class.

Questions that Guide the Study

The research questions studied are:

- How does computerized and paper presentation of text influence reading comprehension among eighth grade students?

- How does an eighth grade student's background experience with digital text affect the student's ability to comprehend when reading from computerized presentation of digital text?

Chapter 2 **Literature Review**

The literature review is organized according to the research questions. First, literature relating to how computer and paper presentation of digital text influence reading comprehension among students is discussed. Then, the idea of digital literacy, the relationship between literacy and technology, and utilizing technology in literacy assessments is described. Finally, literature relating to the second research question, which includes a student's background experience with digital text and their reading preferences, is discussed.

Paper versus Computer Presentation of Text

Whether a student reads information on a paper or on a computer screen can impact his ability to comprehend a text. Kerr and Symons (2006) used a quantitative design to study fifth grade students on the effects of computerized presentation of text upon comprehension. Kerr and Symons noted that previous research stated that utilizing the Internet for literature purposes requires the reader to possess organizational skills. In other words, they must be able to "self-organize their learning and follow their own learning goals" (p. 2). Also, some digital texts may be too visually overwhelming for readers. When computers were used in text only research, results showed that participants had a slower reading speed and low accuracy of proof-reading. In addition, scrolling was found to be a negative influence on comprehension when utilizing computers. Improvement in comprehension was found when the text was displayed in a paginated form.

Since computers are more prevalent in homes and schools, Kerr and Symons felt the results of their study would be important research. In this study, the students were presented with two expository texts: one on paper and the other on computer screen. The students were

timed while reading, followed by a distracter activity. Afterwards, the students were asked eight recall questions and seven inferential comprehension questions. The results showed that the students read at a slower pace from computer screens than from paper. However, the students were able to recall more information read on the computer screen than on paper. The students were more efficient in comprehension when reading on paper. Kerr and Symons make a point that reading rate is usually positively correlated with reading comprehension. The exception would be those readers who try to read faster than their average rate, and therefore do not comprehend as much information. Therefore, the researchers conclude that if computers slow readers down in their reading rate, recall and comprehension should increase.

A similar study was completed by Pao-Nan and Hsi-Chi(2010). However, just online comprehension was observed. Four different scaffolds were presented to students: procedural, strategic, metacognitive, and conceptual. Scaffolding refers to an adult who controls a learning situation so the learner only focuses on what is within his range of understanding. This philosophy is based on Vygotsky's zone of proximal development. Ninety-four undergraduate students who were studying information sciences and technology participated in the quantitative study. The students were assigned one of three instructional treatments: a control group, a static visual scaffold, or an interactive visual scaffold. The control group's literature was presented in hypertext format, along with concept maps that summarize the main idea of the text. The static visual scaffold group's literature contained static images that related to the content. Finally, the interactive visual scaffold group's literature contained flash animations, static images, and concept maps. The students read online literature about the heart. In addition, a test was used to assess students' comprehension of the reading material. The test measured factual knowledge, conceptual knowledge, and rule/principle knowledge. The results showed that the interactive

visual group performed best on the test overall. However, each of the groups outperformed the others on different parts of the test. Pao-Nan and Hsi-Chi concluded that utilizing different scaffolds in online reading can help meet the needs of students with different learning styles.

The differences between paper and computer presented text were studied by Jewitt (2005). The presentation of text and the visuals on the computer screen have set computer presented text apart from paper presented text. Images, according to Jewitt, have a large impact on the reader, more so than written text does. The researcher studied the presentation of the novel *Of Mice and Men* on CD ROM. The presentation of the text is organized differently on screen than on paper. The amount of text is quite shorter per computer page than a paper format. Jewitt noted that the electronic format interrupts the flow and overarching ideas of the novel. A positive quality to the CD ROM presentation of the novel is the use of font to help the reader make connections between the characters when arranged in list format. In application to the classroom, Jewitt stated that newer technologies such as a CD ROM presented text usually coincides with old technologies such as paper-based materials. In other words, it is a rare occurrence that the CD ROM will replace the original book. Jewitt states, "rather than ask 'what is best?', the book or the screen, I think it is more useful to ask what is 'best' for what purpose" (p. 327). In other words, educators should not feel inhibited by technology and its prevalence in today's culture. The world of education will not be totally transformed with new technology. However, education will be enhanced with the new technology. Since technology is growing in importance, teachers should integrate it into the curriculum in order to prepare the students for the future.

When preparing students for utilizing computer presentation of text, the article suggests that teachers assist students in how to approach such a text. Many computer presented texts

contain visuals. Therefore, Jewitt states that students should be taught how to select the important information from such visuals. Another characteristic of computer presented texts is its non-linear format. The guidance of the author and illustrator is less strict on computer presentation of text than on paper presentation. Overall, Jewitt concludes that the different presentations of text should not be viewed as competing modes, but they can coincide and be used when appropriate in reading instruction.

Digital Literacy

Most of the time students spend reading at a computer is when they are on the Internet. Chase and Laufenberg (2011) explain what digital literacy is and what it may look like in the classroom. According to the authors, digital literacy is “a genre, a format and tool to be found within the domain of standard literacy” (p. 535). The utilization of technology within a curriculum allows for authentic learning and accessible information. Therefore, according to Chase and Laufenberg, some educators can feel overwhelmed by integrating digital literacy into their classrooms. The authors include an example of how digital literacy can be used in a lesson in order to encourage discovery and inquiry among students. In the lesson, students research published stories (local, regional, and outside the United States) that speak on a specified current event. After comparing the three sources, the students are asked to research where the authors of the articles retrieved their information. After locating a source, the students read or watch the source in entirety in order to assess how it was used in the article they first read. Without technology and the Internet, the last research requirement would be nearly impossible. However, when integrating digital literacy into the classroom, students are able to become acquainted with the act of researching and sifting through information on the Internet in order to answer questions.

O'Brien and Scharber (2008) take a similar look at what digital literacies entail. The authors' definition of digital literacies is "socially situated practices supported by skills, strategies, and stances that enable the representation and understanding of ideas using a range of modalities enabled by digital tools" (p. 67). O'Brien and Scharber state that schools are promoting a different type of literacy than the literacy students are interacting with outside of schools. Students today read and write in digital form. However, state assessments are print based. The authors encourage the concept of intertwining both print and digital based literature. This is to fulfill the goal that students leave school being literate in the ways of school and of the world.

Another article includes an interview of the New Literacies Research Lab members about how schools in America should approach this topic and assess online reading comprehension. Mokhtari, Kymes, and Edwards (2008) state that online reading involves problem solving skills due to its non-linear format. Even the act of searching information on the Internet requires knowledge on entering terms in a keyword search versus the URL window. The authors state that online comprehension is similar to phonic and phonemic awareness skills used during offline reading. When reading on paper, it is necessary to decode words in a fluent manner in order to properly comprehend. Likewise, "if you cannot read to locate and critically evaluate information, it becomes very difficult to solve the problem that initiated your online reading episode" (p. 355). When it comes to assessing New Literacies in schools, today's practices ensure that the rich get richer and the poor get poorer. Schools of low SES contain students who are less likely to have Internet access at home. Therefore, those schools are focused on reading comprehension and not on integrating technology into the literacy program. Likewise, schools with high SES and students who come from homes with Internet access are not as concerned

about reading comprehension and can therefore take the time to integrate technology in the curriculum. So many students in America are deprived from the necessary knowledge of Digital Literacies.

Technology and Literacy

Implementing technology into literacy curriculum.

Teachers across the country are taking initiatives to integrate technology into literacy curriculums. However, there are many hurdles involved in the process. Labbo and Reinking (1999) explain that

...new technologies intersect with a broad range of issues and practices in literacy instruction, because new technologies are rapidly becoming integral to daily literate activity, and because new technologies are generating instructional issues and demands that are not readily addressed within, and indeed may challenge, conventional frameworks of instruction. (p. 488)

Donald Leu. shared his thoughts on technology integration in schools (Ezarik, 2003). He stated that “we need to recognize that the essence of reading, writing and communication has expanded...” (p. 58). He feels that many educators and school leaders have failed to move their schools to the next stage in literacy education because they are clinging to the original technology in literacy: the book. He also comments on the nation’s refusal to use computers for state assessments in order to evaluate students’ knowledge of New Literacies.

Besides the hurdles technology in itself brings, educators’ philosophies and experience can become a stumbling block to the integration of New Literacies as well. According to Labbo et al. (1998), “Many students and educators view the act of reading traditional text as one of

understanding and reconstructing meaning from the print in a linear fashion” (p. 276). However, the authors point out that today’s technological innovations allows computers to be manipulated in order to meet the needs of the reader. Furthermore, it is important that students are fluent in using many forms of technology. Many people today switch career paths more than five times, and therefore adjust to the new technology that comes with each job. So, educators should encourage students to be familiar with many aspects of technology in preparation for their future careers. Another struggle for teachers is their sense of inexperience and lack of training in technology. Although they have access to computers, they are unsure how to integrate the technology into their curriculum. Therefore, the authors suggest that training educators in technology will provide the confidence they need to properly implement technology.

David Reinking (1997) also discusses the struggles educators face when integrating technology with literacy education. He states that the computer is not the first technology that has affected literacy. “Cuneiform tablets, scrolls, the printing press, books, pencils, and pens are technologies that have had quite specific effects on reading and writing” (Reinking, 1997, p. 630). Therefore, with time, the computer will be another phase in literacy. Regardless, schools still struggle with the transition to technology based instruction. At times, schools lack the infrastructure to implement new technologies throughout their building. Other problems may include only one computer available in a classroom, the lack of appropriate technology or finances to improve technology, knowledge to integrate technology into the curriculum, or knowledge to introduce the technology to the students. However, Reinking states that the benefits of integrating technology into literacy curriculum outweigh the negatives. He states that using computers to meet the goals of literacy is appropriate because printed materials will continue to be available for quite some time and “many traditional goals associated with print-

based literacy carry over into digital forms of reading and writing” (p. 637). Furthermore, technology can enhance the instruction of literacy skills. The computer has the capability of loosely linking digitized speech with typed text. It is also possible that students’ sight word vocabulary can improve while reading computerized children’s literature. Reinking suggests to educators that when integrating technology into the classroom, such activities connect the page and the screen. Also, classroom technology activities should emphasize authentic communication and meaningful tasks. Reinking also suggests that those technology activities include conversations about the differences between print and digital media. Last, those activities should introduce strategies for reading and writing digital texts.

Reinking et al. (2000) discuss the concept of assimilation versus accommodation of technology into the literacy classrooms. According to the Piagetian model, assimilation includes integrating new information with old information arrangements without major changes to the original arrangements. However, accommodation “requires that existing knowledge be restructured to fit new information, which eventually transforms the way a learner views and understands the world” (p. 111). The authors apply this idea to integrating technology into the curriculum. They state that assimilation must give way to accommodation; which means that change is inevitable for classroom educators. In order to successfully integrate technology into the classroom, accommodation is the answer. The motivation behind accommodation is the infiltration of digital reading and writing into the daily activities of people’s lives. Technology’s prevalence in society makes it a priority in education today.

Judson (2009) discusses the affect of technology upon the learning of students. He refers to students who are competent in technology as “open door” students. His quantitative study was driven by the stance that self-confidence is a result of improved technology literacy, and

therefore encourages an improvement in academics. In turn, students can use their technology skills as a tool in their learning. The participants included 8,000 students across 68 schools who completed an assessment that judged their technology literacy and then an assessment that evaluated their proficiency in the subject areas. The results showed that “improved technology literacy and academic achievement are correlated in the area of language arts” (p. 280).

However, Judson notes that academic improvement was quite small among the students.

An observation of the integration of digital texts in a classroom was recorded by Dr. Eileen Honan (2009) of the University of Queensland, Australia. Honan entered schools of low and middle/upper socioeconomic status. In her qualitative study, digital text included computers, hand-held games, gaming consoles, digital cameras, and other sources. Five literacy sessions within a classroom were observed at four different schools. The frequency of Honan’s visits varied from one classroom to the next. The interactions observed included students using a computer in some way. Honan’s results showed that the teachers integrated technology into the curriculum, even though the technology was “used in artificial and meaningless contexts” (p. 33). Therefore, she suggests that educators rethink their pedagogical routines so they can assist students in making sense of the digital texts they utilize outside of the school. Honan’s conclusions are meant to encourage educators to reflect and discuss how to improve their use of technology in the literacy curriculum.

Digital technology and struggling readers.

McKenna, Reinking, Labbo, and Kieffer (1999) discuss the concept of utilizing digital text to assist students who struggle with reading. First, the article cites four major differences between paper and digital based texts. Electronic text is interactive, bringing so much more to the text than paper based texts. Second, reading electronic texts can be supported by teachers or

software developers in order to foster comprehension. Third, electronic and print texts are structured differently. For example, the linear format of paper based text is no longer in existence when text is presented digitally. Finally, a variety of icons and multimedia presentations are available to digital readers compared to paper readers. Besides the differences between text formats, digital texts can offer a variety of tools to struggling readers. Translational tools are available in forms of glossaries, dictionaries, and pronunciation guides. Illustrative resources and visualizations assist those who rely on visuals to learn and understand. Summarizing resources provide an overview of what is being read to readers. Finally, tools that allow readers to collaborate with other readers on a text provide assistance to those who understand best when discussing with others. In reflection to the tools available to struggling readers, McKenna et al. state, "As the number of electronic texts continues to climb and as children's access to them becomes easier, the distinction between who is disabled and who is not will become increasingly blurred and of questionable usefulness" (p. 114). With the provided tools and perks of digital texts, it is easy to see why there is such a push for such things in today's classrooms.

Using qualitative research, Hasselbring and Goin (2004) analyzed a specific computer program called the Peabody Learning Lab. They observed a technology-based intervention program for older struggling students. Students' performance in the United States does not compare to other countries in the world. Hasselbring and Goin listed numerous reasons why U.S. students are behind others. First, time spent interacting with literature before students step foot in a classroom greatly affects future reading ability. Young children's language experiences also have a great impact. Furthermore, when students enter middle school, they are faced with more challenges, including more expository texts, peer-pressure, and puberty. Hasselbring and

Goin suggest four principles a program should follow in order to combat the difficulties older students have in reading. First, reading programs should be relevant to students' lives and provide motivation. Second, the program should be mindful that students are not embarrassed due to their reading ability. Third, students should have control over their learning experience. Finally, students' strengths should be emphasized versus their weaknesses. The Peabody Learning Lab consists of three sub-labs: reading lab, word lab, and spelling lab. Hasselbring and Goin observed 63 students between the grades of sixth and eighth. Students used the program for thirty minute for an entire school year. The program was also supplemented with book-on-tape and high-interest, low-level books. Some of the students did not receive the Peabody Learning Lab program in order to provide a control group. The results among those using the program were positive and revealed growth in reading ability.

Blachowicz, Bates, Berne, Bridgman, Chaney, and Perney (2009) observed 18 classrooms that implemented a technology assisted literacy program across 11 at-risk urban schools. They studied how the program assisted struggling readers. The researchers observed the classrooms during two-hour blocks over a three year period in order to capture a baseline. After their study began, some of the schools were introduced to literacy software called *Innovations for Learning (IFL) Computer Reading Program*. The IFL program contained a strong phonics component. The curriculum was organized so students rotated through stations in the classroom. Blachowicz et. al. collected five forms of data: environmental scan, completion of an observation rubric, teacher interview protocol, student interview protocol, and measure of student performance. The findings showed that IFL was well liked by both teachers and students. Students continued to exhibit engagement in the activities incorporated in the technology throughout the school year. Teachers also approved of the utility of IFL and how the

students responded to it. The activities were engaging and not just workbooks on a screen. Also, this program enabled differentiation in the classroom. The program encouraged independent work habits among the students, along with supporting students' skills and confidence in reading and technology use. Finally and most importantly, students "showed significant gains in their literacy skills on standardized measures even in classrooms and schools that were not exemplary" (p. 403).

Computer Reading Assessments

Kobrin and Young (2003) studied the similarities and differences between computerized and paper-and-pencil assessments. This quantitative study included forty-eight juniors and seniors from a public university. Participants were divided among four groups of twelve. Groups A and C took the computerized test, then the paper-and-pencil test. Groups B and D took the pencil-and-paper test, then the computerized. Kobrin and Young took reading comprehension passages from the ETS GRE General Test Big Book. Two long passages that involved scrolling on a computer were selected. The passages contained 55 lines and seven comprehension questions. Before the reading took place, each participant was interviewed. The interview questioned the students' experience, familiarity and comfort with computers, and computerized tests. They were also interviewed about their familiarity with questions and passages from the GRE and their scores on the GRE or SAT. The researchers studied the participants words and strategies during the reading and question process. Kobrin and Young found that the strategy used did not affect the thinking process of the readers. Therefore, they assume that "examinees taking a paper-and-pencil test may have a false perception that having the ability to write on the passage improves their comprehension of the passage" (p. 133). They also conclude that "examinees taking a computerized test may be compelled to process the text

more deeply because they cannot rely on physical aids” (p. 133). Therefore, computer based assessments may be a better tool for discovering comprehension construction. Overall, the findings did not show a strong lead in which assessment showed better comprehension. Therefore, Kobrin and Young conclude that computerized assessment reveals one’s comprehension just as much as a paper-and-pencil assessment.

Pomplun and Custer (2005) completed a quantitative study in response to the increased use of technology in today’s assessments. Participants included 2,000 students across 20 schools. The researchers used the *Initial Skills Analysis*, which is a series of reading screening tests for grades K-3. This assessment measures vocabulary, reading comprehension, and spelling. The tests contain 35 to 41 multiple-choice questions. The computerized assessment presentation was arranged so that no scrolling was necessary in order to see the reading passage and the questions. The researchers acknowledged the numerous concerns that would affect scores. Some of these concerns include “computer delivery of reading passages, student differences in computer familiarity, and teacher versus computer delivery of oral administration” (p. 154). Students took both formats of the assessment within a two week period. Schools were randomly assigned whether their students took the computerized format or the paper-and-pencil format first. The students read and answered the same passages and questions for both forms of the assessment. If students’ scores rose, then the researchers considered the reason to be a practice effect. However, if students’ scores fell, the researchers would consider the reason to be a fatigue effect. The results revealed that the students performed slightly better on the paper-and-pencil format than the computer format.

Horton and Lovitt (1994), in a quantitative study, observed secondary students’ results on paper and computer based assessments. Participants included 72 students from science and

social studies middle and high school classes. The assessments grouped students into three groups based on reading ability in order to encourage differentiation. The researchers noted there is a need in secondary classrooms for a teacher to meet the variety of needs among their students. According to Horton and Lovitt, this is due to the difficulty of some textbooks. Supporting reasons for this study include the ability to compatibly present secondary textbook information via computer, textbook modifications occur naturally when presented via computer, student failure while reading textbooks stems from improper presentation of information, presentation of information on computers is accessible to students at any time, and computers in schools are not integrated into the curriculum as teachers wish. In the study, students read textbook passages on computers, completed a study guide, and took a 15-item test on a computer. Then, the students read passages from their textbook, completed a study guide, and then a 15-item test on paper. Students read passages of 1,000 words in length. The study guides contained 15 questions about the main ideas of each passage. The results revealed that the students preferred to learn information via a computer. Teachers also preferred evaluating their students via computer.

Topping, Samuels, and Paul (2007), in quantitative study, observed the use of computerized assessment for implementing a quality reading program. Students' results were compared in order to reveal the program's effectiveness. The researchers noted that increasing reading practice, or quantity, among students does not promise an increase in reading achievement. However, quality of reading practice must be considered as well. In order to achieve this, better data is necessary for feedback. An efficient and cost-effective way to implement this in the classroom is via computerized assessment. Another way to achieve quality reading practice is ensuring that students are practicing at "a level at which they are

appropriately challenged by exposure to new vocabulary and concepts but not confronted with failure, avoiding unproductive reading at levels too low or high for effective learning to take place (p. 193). So, the researchers observed reading achievement among students who utilized a computerized assessment program and how their performance was affected by the way the program was implemented in each classroom. Students in grades one through twelve from 139 schools participated in the study. Their reading achievement was observed via the STAR Reading program and Accelerated Reader program. Both programs are computerized assessment programs. Results showed that the lower grades improved more than higher grades on reading achievement. Also, low achieving students made more progress than high achieving students when utilizing the programs.

Experience and Preference of Computer Use

Spencer (2006) studied preferences for reading mediums. Two hundred fifty-four Royal Roads University School of Business learners participated in this qualitative study. The students participated in interviews about their course-related reading habits and choices. Six students were then selected for a follow-up interview. Spencer notes in her literature review that readers' actions may be different from their preferences in reading. In other words, students may read from computers and paper, but may prefer reading from paper only. She also notes that there is "not yet an adult population that has learned to read and study exclusively in an online environment" (p. 39). Therefore, the age and experience of the participants affects the results in this study. Many participants noted that reading from a screen has a negative affect on their eyesight. Spencer found that although a variety of technology tools are available to the learners, they still prefer to read from paper. One reason for their preference is how enjoyable it is to hold a book in one's hands and feel the paper of a book. Another reason for the preference for paper

is so readers have a hard copy of important documents for future use. Also, learners have security in case they lose their electronic data due to low battery or poor connectivity. Some prefer to read with a highlighter. Others shared that they read slower on screen than with paper. All of these reasons provided Spencer with an insight into the preferences of students today.

Burke and Rowsell (2008) interviewed and observed four middle school students about their online literacy practices. The participants were between 11 and 12 years of age. Burke interviewed the students while sitting next to them at a computer. The researchers observed what reading practices were used to create meaning from websites, and what students do online to show how they read, compose, and communicate visually. Students were asked if they had a computer at home, which sites they visit and why, how often they visit those sites, whether they visit the sites alone or with friends, where they begin reading on a screen, what they like or dislike about a site, how they would redesign the site and why, and what the students prefer in website design. Results revealed three key issues in literacy: motivation, comprehension and engagement. Burke and Rowsell found there are numerous ways students navigate websites. Many of the students focused on the interactive features provided on websites. Such choices and options provided on the Internet were an appealing factor among the students. The researchers found that when speaking about their favorite websites, students rarely mentioned the content of the website's literature in written word. This concerned the researchers, especially in reference to how English educators should respond to the literacy of today's students.

Eshet-Alkalai and Chajut (2010) studied whether age affects one's digital literacy. Two previous studies utilizing the same participants were compared in order to find trends among various age groups and their digital literacy. The previous studies revealed that it was not age, but technology experience that affected one's digital literacy. Eshet-Alkalai and Chajut

discussed the numerous aspects that attribute to digital literacy. Photo-visual literacy skills require computer users to use vision to think, due to the visual-filled computer atmosphere. The reproductive literacy skill allows users to create visual art and written works via computer. The branching literacy skill allows users to follow links in a non-linear fashion in order to pursue the desired information. The information literacy skill allows the user to shift through the information presented on the Internet in order to acquire the desired information. The socio-emotional literacy skill equips users to participate in mass communication on the Internet. Last, real-time thinking skills allow users to handle large amounts of information presented on the computer. After comparing the previous studies, the researchers found that “experience with technology is responsible for the changes over time in digital literacy skills, regardless of their age” (p. 178). The older participants in both studies made great progress in their digital literacy skills, whereas younger participants improved a small amount. Therefore, Eshet-Alkalai and Chajut conclude that as time continues, the technology experience gap between the young and old will decrease.

Chapter 3 Methodology

Previous research included findings that ranged from the use of computerized assessments and remediation with students, to the affect of computerized literature upon students' comprehension. The *Research Education Complete* database was utilized for collecting articles for literature review. The term "technology", "literacy", "digital literacy", and "new literacy" were used as the subject keywords. Articles that were included had to pertain to technology *and* reading.

Participants

My final project was a case study of three eighth grade participants and incorporated a mixed design research project. I chose this design because I felt the collection of qualitative and quantitative data would produce well-rounded results. I studied the influence of computerized presentation of digital text on the reading comprehension of three eighth grade participants at a small private Catholic school in Western New York. Only the data from three randomly selected participants across the grade were incorporated into this research. After consent was granted, three participants' names were randomly drawn from a bowl. The participants included two girls and one boy. The ages range from 13-14 years of age. All three participants were Caucasian. All spoke English as their first language. There were no participants with special needs in this study.

Data Collection

This study is a mixed design study because both qualitative and quantitative data were collected. The qualitative information consisted of interviews with the participants about their preference and experience with reading from digital text. In addition, the participants' chapter

retellings provided qualitative information as well. The quantitative data included the scoring of the retellings based on the number of ideas retold, in addition to the number of comprehension questions correctly answered for each chapter. Table 3.1 shows the order of data collection for this study.

Table 3.1

Data Collection Schedule

Date	February 7	February 9	March 6	March 13	March 13	March 20
Data Collection	Initial Interview	Paper Chapter 1	Computer Chapter 3	Computer Chapter 4	Paper Chapter 5	Final Interview

Between February 7, 2012 and March 20, 2012, the three participants partook in interviews, read literature on pieces of paper, and read literature on a computer screen during numerous occasions. They read chapters from the short story *Hooch*, a publication of the Buffalo Newspaper for young adults. The procedure took place during the normal practice of English class on Tuesdays and Thursdays.

Interviews.

On February 7, I audio-taped, utilizing an iPod, an interview with each of the eighth graders about their experience with digital literature. Participants were asked about their familiarity with computers, how often they used the computer and for what purpose, and if they could identify similarities or differences between reading from a computer or paper. Later, on March 20, the participants were audio-taped while I interviewed them about their opinion and preference of reading medium: paper versus computer screen. I also inquired as to whether their preference was impacted by the text. The participants were once again asked to identify similarities or differences between computer and paper-presented text. The interviews were transcribed at a later time in order to identify trends.

Readings.

On February 9, each participant read chapter one of *Hooch* which was presented on a piece of paper. After they completed the reading, I audio-taped each participant and asked him or her to retell what had been read by asking, "Tell me about what you just read." Afterwards, I asked five open-ended comprehension questions about the passage. They were called one at a time to read the passage.

On March 6 and 13, each participant read chapters three and four, which were presented on a computer screen. The procedure for the paper chapter was repeated. However, a computer text was read by the participants instead.

On March 13, each participant read chapter five, which was presented on a piece of paper. Once again, the procedure for the computer chapter was repeated, with the exception of the text being a paper text.

Data Analysis

All participant responses recorded by the iPod were typed in transcript form. This included chapter retellings, the responses to the comprehension questions, and the interviews. Responses were recorded in narrative code (Bogdan & Biklen, 2003) in order to easily identify the specific responses made by the participant.

During each retelling, the total number of ideas that a participant recalled were tallied. A variety of points were earned according to the depth of the retellings (Goodman et al., 2005). The participants' ability to answer the five comprehension questions correctly for each chapter was totaled as well. One point was administered for each correct response. The sum of points from the retellings and comprehension questions interpreted how well the participant

comprehended a particular chapter. In addition, a participant's performance with paper chapters versus computer chapters was compared. From these comparisons, it was determined whether reading on paper, or from a screen, produced better comprehension for that individual participant. Afterwards, the participants' results were compared and the results were analyzed for common trends. Finally, a comparison was made between experience with technology, preference for a particular reading medium, and comprehension performance among individual participants. In Chapter 4, the results and interpretation of the data will be introduced.

Chapter 4

Findings

Background

Hooch, a short story for young adults published by the Buffalo News, was the central reading for this study. First, the participants retold each chapter while I recorded their responses using the iPod voice recorder. Retellings were scored using Yetta Goodman's Retelling Guide (see Appendix A for a retelling guide) (Goodman et al., 2005). Participants' responses were scored according to the characters recalled, what they revealed about the characters' personality development, and the events from the plot. Based on a possible 100 points per chapter, main characters and main events were worth the most points. In addition to the retelling guide, comprehension was assessed by five comprehension questions. The first three comprehension questions requested factual information, while the last two comprehension questions required inferential responses. Each question was worth one point, with a possible total of five points received per chapter.

In order to understand each participant's preference and experience with digital text, participants were interviewed and their responses were recorded (see Appendix B for interview questions). The initial interview included questions inquiring about their familiarity with the computer, how often they used it, and their opinion of the differences between paper and digital text. The final interview inquired how much they enjoyed reading *Hooch*, how paper and digital texts compare or differ, which medium they preferred to read from, and if their preference would change if they read a different text.

Retellings, Comprehension Questions, and Experience and Preference of Computer Use

In order to analyze how computerized and paper presentation of text influenced reading comprehension among the eighth grade participants, each participant's data is discussed and

interpreted, followed by a comparison of all of their scores. In table 4.1 and 4.2, each participant's score for each chapter is listed. Chapters one and five are paper-presented chapters. The total score for both chapters is listed under the *Paper* column. Likewise, chapters three and four are digitally-presented chapters. The total score for both chapters is listed under the *Computer* column. The *Difference* column lists the difference between the paper and computer scores. Positive numbers indicate that a student's score was higher for computer texts. Meanwhile, negative numbers show that a participant's score was lower for computer texts. The *Total* column represents a participant's score for all four chapters.

Table 4.1

Chapter Retellings

	Chapter 1	Chapter 3	Chapter 4	Chapter 5	Paper	Computer	Difference	Total
Kim	31	50	84	35	66	134	68	200
Ethan	45	44	75	50	95	119	24	214
Meredith	47	69	89	71	118	158	40	276
Total	123	163	248	156	279	411	132	

Table 4.2

Chapter Comprehension Questions

	Chapter 1	Chapter 3	Chapter 4	Chapter 5	Paper	Computer	Difference	Total
Kim	3	4	5	5	8	9	1	17
Ethan	4	2	4	5	9	6	-3	15
Meredith	4	4	4	5	9	8	-1	17
Total	11	10	13	15	26	23	-3	

In order to assess whether a participant's experience with digital text affected their comprehension of computerized text, each participant's interview responses were compared to their retelling and comprehension question scores for digital chapters.

Kim's story.

The first participant, Kim (a pseudonym), is a vibrant student who has many passions, but struggles to make school one of them. However, she approached the *Hooch* chapters with enthusiasm. During chapter retellings, she performed the best for chapters read on the computer. Her score was 68 points higher when she retold computer chapters versus paper chapters. After the chapter retellings she answered comprehension questions. She correctly answered about the same number of questions between computer and paper-based chapters; her computer score was just one point above her paper score. She tied with another participant for the highest score in comprehension questions overall.

It was observed that Kim improved her retellings over time. However, for the final chapter she seemed uninterested in the retelling and interview, which affected her score. When prompted during the retelling, she responded "I don't know." Therefore, she was unable to express the main ideas and events from that chapter. When asked the comprehension questions for that chapter, Kim was able to recall all of the necessary information and received a perfect score. Therefore, Kim was able to understand what happened in that chapter, but did not understand it enough to be able to retell it.

In conclusion, Kim was able to retell and comprehend the most from chapters read on the computer. Out of the three participants, her data showed the greatest difference in points between chapters read on paper and computer. Therefore, it can be concluded that the type of medium she read from greatly affected her comprehension and retelling ability. Kim may benefit from reading from a computer on a regular basis.

Kim's opinion.

During the interviews, Kim expressed familiarity with using the computer to read, but when asked how often she used the computer, she stated, "A lot at school, but not at home...Because I don't have one." When asked about similarities and differences between paper and digital presentation of text, Kim identified turning pages versus scrolling. Also, she stated that computer screens tend to present fuzzy font. After reading *Hooch*, she preferred reading from paper because "the computer is slow and it freezes and looks fuzzy." When asked if her preference between paper and computer would change if she read something other than *Hooch*, she thought there was a chance. However, the slow computer and fuzzy font would be a stumbling block. In conclusion, Kim is familiar with the computer, but does not use it for reading or very often at all. Surprisingly, she performed better with the computer presented text. It seems that her familiarity with the computer assisted her in retelling and comprehending the computer presented text.

Ethan's story.

The second participant, Ethan (a pseudonym), is a bright student who also struggles with motivation in school. He was able to retell ideas for both computer and paper-based chapters in a consistent manner, with the exception of one particular chapter which he retold 25 more ideas from than usual. Overall, he retold the most ideas from computer chapters with a difference of 24 points between computer and paper-based chapters. Ethan was also consistent when correctly responding to comprehension questions for both paper and computer chapters. Overall, he received the most comprehension questions points for chapters read on paper.

It was observed that Ethan was able to provide great detail and truly understood the big picture of each chapter. He did not need much prompting at the beginning of retellings. It was also observed that retelling the chapter allowed him to jog his memory for more information.

For example, when retelling part of the final chapter, he stated,

Um, oh Kenny was in Plattsburgh...and um, he was walking home ...and Frank and Peter and [a] whole bunch of other kids were going to make fun of him ... and then um, Eddie pulled up in his um, car and...oh, he asked him where the Champlain Hotel was or something like that and uh Eddie told him and they asked him how he knew him and he lied because he didn't want them to know what really happened and to start rumors and stuff.

As Ethan was retelling the street scene, he was able to recall various parts of the story. Here, Ethan was able to remember why the character pulled up in his vehicle and what building he was looking for.

In conclusion, Ethan was able to retell the most ideas and correctly answer the most comprehension questions for chapters read on the computer. He showed the least difference in scores between computer and paper-based retelling and comprehension ability. Therefore, it can be concluded that the type of medium Ethan is reading from does not greatly affect his ability to comprehend. Although Ethan performed better when reading from the computer, it was not by a large amount.

Ethan's opinion.

Ethan expressed different views than Kim in that he was not familiar with using the computer for reading and often used the computer for personal use, such as social networking. When identifying similarities and differences between paper and digital text, he replied, "Well, a

book you can take wherever you want...and a computer, you can only stay in that one spot, and it hurts your eyes after a while.” When reading *Hooch*, he preferred reading from paper because “It’s [kind of] fuzzy.” He concluded that his preference would not change if he was reading something other than *Hooch*. In conclusion, Ethan was more familiar with paper presented text even though he does use the computer often. However, he performed better when reading *Hooch* from the computer. Although he is not familiar with reading from the computer, he performed well when retelling and answering comprehension questions about computerized text.

Meredith’s story.

The third participant, Meredith (a pseudonym), sets high goals for herself in school, and usually meets them. She received a high number of points for retelling both computer and paper-based chapters. She retold the most ideas from computer-based chapters with a difference of 40 points. She also was able to retell more ideas from the chapters than Kim and Ethan. When answering comprehension questions, Meredith received the greatest number of points for paper-based chapters. However, the difference between her ability to answer comprehension questions correctly for paper and computer-based chapters was small. Like Kim, she received a high number of points when answering comprehension questions. In addition, Meredith also revealed the most understanding of the chapters in *Hooch* compared to Kim and Ethan.

It was observed that Meredith had a firm grasp of the overarching theme of *Hooch*. Even though she was unable to remember exact details at times, she fully comprehended the storyline and could infer the motives of the characters. When discussing why a character completed a certain act, Meredith stated it was, “Because he didn’t want really anyone else to know and he didn’t...I think he cares for his Uncle George a lot and he doesn’t want him to get into trouble.” She was able to pinpoint the main character’s conflict by using facts from the story. As her

scores reveal, Meredith was able to perform well with both mediums. Overall, Meredith performed best in retellings and answering comprehension questions when reading chapters from the computer. It appears that Meredith is able to perform well with both types of medium, but is slightly stronger with computer presented text.

Meredith's opinion.

Meredith is very familiar with using the computer to read and often uses it for “social networking, emails, [and] sometimes articles on the computer.” Some similarities and differences identified by Meredith were how the brightness of the screen can cause headaches and scrolling on the computer. However, she does not mind either medium and stated that “it doesn't really bother me, I like both ways, but computers are just brighter, sometimes [kind of] gets annoying, gives me a headache, but that's about it.” After reading *Hooch*, Meredith viewed both computer and paper presented text equally and did not mind reading from either source. When asked if her preference would change with a different text, she stated that she would prefer to read a longer text on a piece of paper. In conclusion, Meredith is familiar with reading from the computer, which is reflected in her performance retelling and answering comprehension questions about computer-read chapters.

The students' story.

Table 4.3

Retelling and Comprehension Question Results

	Chapter 1	Chapter 3	Chapter 4	Chapter 5	Paper	Computer	Difference	Total
Kim	34	54	89	40	74	143	69	217
Ethan	49	46	79	55	104	125	21	229
Meredith	51	73	93	76	127	166	39	293
Total	134	173	261	171	305	434	129	

Now that each participant's performance has been discussed, they will be compared as a whole. Overall, the participants retold the most ideas about computer-based chapters. However, the participants answered the most comprehension questions correctly when asked about paper-based chapters. When the participants retold the chapters, all three participants performed best during the second computer-based chapter. However, when the participants answered comprehension questions, they performed best on the final print-based chapter. When scores from the retellings and comprehension questions were totaled, the participants performed best during the second computer-based chapter. This may be due to becoming more comfortable with retellings and the storyline of *Hooch*. Participants' retelling scores seemed to be affected greatly by whether they were reading from the computer or paper. There was a 132 point difference between print and computer scores. However, participants' comprehension scores were barely affected by whether they were reading from the computer or paper, resulting in a three point difference between the two. After the participants' scores were summed, it was discovered that the participants performed best during retellings and answering comprehension questions about chapters that were read on the computer. There was a 129 point difference between the participants' total print and computer-based text score.

The students' opinion.

All three participants had a variety of experiences with paper and computer-based text and also used a variety of text for different purposes and at different frequencies. However, all three participants performed best when reading computer presented text. Therefore, it appears that a participant's experience with computerized text does not affect how they perform when

retelling and answering comprehension questions about digital text. There may also be unknown factors affecting their comprehension.

Chapter 5 Discussion

Relationship to Questions and Theory

The importance of technology in education is increasing. In order to keep their students on the cutting edge, schools are investing in the integration of computers, iPods, iPads, and SMART boards. Therefore, it is vital that teachers integrate such tools into the curriculum, especially for literacy purposes.

Computerized and paper presentation of text influenced reading comprehension among the three eighth grade participants. Participants were able to retell and correctly answer comprehension questions with more detail when responding to chapters read on the computer. This was found among each participant, as well as the three participants as a whole. Therefore, educators may be encouraged to use technology in literacy curriculum in order to improve reading comprehension among students.

In addition, an eighth grade student's background experience with digital text did not affect the student's ability to comprehend when reading from computerized presentation of digital text. Two participants did not have experience using the computer for reading. One of those two participants had little experience using the computer at all. However, both performed best with retelling and answering comprehension questions about computer-presented chapters. Therefore, educators may be encouraged to integrate technology into a literacy curriculum no matter the experience the students may or may not have.

These findings are supported by the ideas of Leu (1999). He supports the movement from strictly paper literature to the integration of digital text as well. In order to prepare students for the future digital age, educators need to be open-minded about new technology in the

classroom. The results of this study show how such integration may benefit the students' comprehension, no matter a student's background. In addition, my stance on the metacognitive theory is supported by this study's findings. By providing students with experience reading from a variety of mediums, students become aware of which type of text presentation works best for them. Students may develop a preference for text size, medium size, and screen display. Experience with digital text in the classroom will provide an opportunity to make such preferences.

Significance

The findings in this case study should hold great importance to educators today. First, the ISTE and Core Standards require technology to be integrated into the classroom. This is reason enough to integrate such mediums into school curriculums. In addition, there is no question that technology is expanding. In order to equip learners for the future, educators must be willing and supportive of the integration of technology into the classroom.

Literacy today is not limited to a paper book by any means. More individuals are partaking in literacy activities using a technological device, such as educational apps or reading an eBook. A computer center can be found in many classrooms today. However, some teachers may have not considered utilizing them for literacy activities. This study suggests that reading from the computer may positively affect comprehension of students.

Limitations

Three limitations of this study were identified. The most obvious limitation was the number of participants. With three participants, the research became a case study. Because there were only three participants, each participant's personality, reading preference, motivation, and self-discipline affected the results greatly. The results from this study cannot be generalized to

other students in other situations. The results from this study only provide information about the three participants. It was found that the three selected participants comprehended best from the computer, but would all students produce the same outcome? This can only be assumed from this study.

The second limitation involved the participants' familiarity with retellings. It is an uncommon practice in schools today to assess students' comprehension based on their ability to retell a story. This may be due to the number of students in a classroom, the amount of time a teacher has in a school day, or the genre of text read. However, the retelling assessment was useful in identifying the characters, character development, and plot the participants were able to recall and understand from *Hooch*. It was observed that the participants were more comfortable and able to recall more information from chapters after retelling a few times. Therefore, it is uncertain whether the participants would have performed better if they had more retelling practice.

A third limitation is the restricted amount of qualitative data collected during the study. The qualitative data collected in this study included interviews of the participants' computer preferences and experiences. However, information regarding the participants' scrolling habits and body language while at the computer would have provided insightful information about the participants reading digital text. Therefore, the limited amount of qualitative information has restricted the information gained through this study.

Future Research

Due to the importance of technology in the classroom, further research would provide valuable information to the world of education.

Number of participants.

One recommendation for future research is to study more participants reading from paper and digitally-presented text. With a larger number of participants, more consistent data may be collected. Therefore, the findings would be of more importance to the world of education.

Technology variety.

Another recommendation for future research would be to study students' comprehension when reading from a variety of technology mediums. Some examples would be reading from an iPod, iPad, eBook, or even phone. How these mediums present text, turn pages, or are held by the reader could affect the outcomes of the research. This information would also prove useful to schools thinking about purchasing technology for literacy education.

Text variety.

A third recommendation for future research is the use of a different text. How texts of various lengths, genres, and topics may affect the comprehension of participants reading from paper or computer may produce various results. Also, a text that is more appealing to the participants may have an affect on how much a student comprehends.

Scrolling.

A final recommendation to include in a future study is how scrolling affects the focus and comprehension of a participant reading a text on the computer. The scrolling may either distract the reader or help the reader remain focused throughout the chapter. This information would be useful for those states considering computerized testing.

It's a Friday afternoon in a private Catholic school, and the eighth grade students are settling into their seats with their books, nooks, and iPods in preparation for independent reading

time. Meanwhile, the principal briskly walks down the hall, glancing into classrooms as he passes by doors. Seeing the eighth grade using a variety of technology devices for learning, he considers how he may integrate more technology into his school, either with SMARTboards, improved computers, or iPads for each student. How such an investment would positively affect the students' learning, he may never know.

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Appendix A
Retelling Guide: In Depth Procedure

Reader: _____ Date: _____

Book Title
Chapter Title

Character Analysis:
(40 points)

Recall (20 points)

10-Character

10-Character

Development (20 points)

Character

5-Development

5-Development

Character

5-Development

5-Development

Events:
(60 points)

_____ Event Description. (20 points)

_____ Event Description. (20 points)

_____ Event Description. (20 points)

Total Points: _____

