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IMPROVING READING COMPREHENSION THROUGH PRIOR
KNOWLEDGE ACQUISITION VIA DIGITAL GAME BASED LEARNING

by

Julie Hooker Forbess

A Dissertation

Submitted in Partial fulfillment of the

Requirements for the Degree of

Doctor of Education

Major: Instruction and Curriculum Leadership

The University of Memphis

December 2010

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DEDICATION

For Andrew, my quintessential digital native, for always playing video games with me and for putting up with all of the homework I've had to do for so long.

Love, Mom

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First I thank my husband, Jay who from the beginning said, “Go for it” despite the sacrifices this process has caused all of us to make from time to time. Without his support and encouragement, I would never have started this journey.

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ABSTRACT

Forbess, Julie Hooker Ed.D. The University of Memphis. Improving Reading Comprehension Through Prior Knowledge Acquisition Via Digital Game Based Learning. Major Professor: Michael M. Grant, Ph.D.

As a result of the Tennessee Diploma Project, Tennessee students must meet ACT standards in order to achieve high school graduation. However, the reading level of the ACT is beyond that of many average students enrolled in high school. The reading section of the ACT, in fact, utilizes many excerpts from classic literature. Classic literature is also included on the reading lists of most school systems across Tennessee as well as the entire country. Many students are unable to connect to the characters and contexts of classic literature because they lack the necessary prior knowledge to make this type of literature meaningful. This study was designed to look at whether prior knowledge could be provided through classroom experiences in order to aid in the reading process. Research about the reading process reveals that it is an information processing cycle wherein information about new text is matched to what the learner already knows and then is processed and stored. In fact, readers with poorly organized prior knowledge may make invalid connections between prior knowledge and new material. Therefore, to supply prior knowledge to participants, they played a commercial-off-the-shelf video game to gain familiarity with the genre of detective fiction and more specifically with the characters and typical plots and settings of Victorian era detective stories. Game play was used in conjunction with meta-cognitive activities to promote transfer from playing the game to reading the literary selection. It was theorized that this prior knowledge took the form of temporary models or scaffolds and provided a temporary model of the genre and the literary elements of a particular type of literature.

Since the transfer of the prior knowledge was critical, near and far transfer of the information from the video game to the literature was also examined. Although all results were non-significant, questions were raised about instructional strategies that address prior knowledge and transfer.

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CHAPTER 1

INTRODUCTION

At the start of the 2009-2010 school year all Tennessee public high schools were required to implement the Tennessee Diploma Project. The new Tennessee Diploma project requires public schools to align curriculum to ACT standards (Tennessee State Department of Education, 2008) and mandates the implementation of *active learning*, which has several policy implications including the use of technology to improve instruction. *Active learning* is described as implementing instruction in ways that invite students to participate in their own learning during which the teacher will serve as a facilitator (Tennessee State Department of Education, 2008). Strategies such as cooperative learning, peer tutoring, technology, and the application of knowledge to real life situations are promoted (The Tennessee Department of Education, 2008).

This new focus is in response to the American Diploma Project, which was launched and encouraged by Achieve, a bipartisan consortium of Governors and corporate leaders in conjunction with The Education Trust, and the Thomas B Fordham Foundation (Achieve, Inc., 2009). The American Diploma Project is concerned about providing increased rigor in coursework at all grade levels in order to prepare students for post graduation work or schooling. The American Diploma Project contends that although more than 70 % of high school graduates enter two- or four-year schools, at least 28 % of them have to take a remedial English course in their post secondary educations. As a result, to date 34 states have become part of the American Diploma Project. To meet the mandates of this new initiative, it is vital to schools and students

within those schools that new methods of instruction are developed to enable students to reach the rigorous goals set for them.

Because of the American Diploma Project and the Tennessee Diploma project specifically, ACT scores for many schools and school systems have declined or failed to improve (Silence, 2009). The expectation for lower scores is based upon trends reported across the nation, as well as local trends. Although national ACT results report a nationwide increase in reading scores from 21.2 in 2003 to 21.5 in 2007 (Activity, 2007), these ACT scores do not hold true for schools that serve large numbers of African American students. These schools saw composite scores of 16.9 in 2003 to 17.0 in 2007, showing a clear need for educators to examine methods for improving scores for this group in particular.

Further, as the American Diploma Project is put into practice by additional states, national ACT scores are likely to fall since all students in several states, including Tennessee, will be required to take the exam, not just students who plan to attend college. Actually, scores for 2008 ACT test takers showed no improvement over the 2007 scores (Activity, 2008). This result is attributed to a 9 percent increase in the number of test takers from 2007, because of the implementation of the American Diploma Project in new states. In fact, the scores for 2008 showed the first decline in overall scores for the first time since 2006 (Activity, 2008).

It is important to recognize that two of the sections of the ACT are dedicated to English-language arts and reading, while a third addresses science. Historically, researchers have linked science performance to reading ability. For example, Finkelstein and Hammill (1969) proffered an alternative reading-free assessment of science

knowledge because of the inherent link between reading comprehension and science. More recently, Visone (2009) confirmed correlations between these variables as well. So, since three sections of the ACT depend to some extent on reading ability, English, Reading, and Science/Reasoning, instructional strategies that are directed at improving reading comprehension suggest potential as a positive effect on ACT scores for all students.

Reading Instruction

Language Arts instruction in reading in the United States has had a heavy focus upon what is commonly known as classic literature. In fact, early reading instruction was limited to Greek and Roman classics read in the original languages until the 1870s (Tchudi & Mitchell, 1989). Limited works of British and American authors entered the curriculum at this time, but teachers focused on literary history, biography, and criticism rather than having students actually read the literary selections (Applebee, 1974). In the 1890s colleges first began to establish classes in contemporary literature. For example, Yale studied *The House of the Seven Gables*, written in 1851 as a work of literature for the first time in 1894. College entrance exams began to require students to show knowledge about classics such as *Silas Marner*, first published in 1861, and Shakespearean plays including *Julius Caesar*, *Macbeth*, and *Hamlet*, thereby making these works standard elements of high school curricula (Tchudi & Mitchell, 1989). These works remain today, over 200 years later, as essential components of English classrooms across the country despite the rapidly changing world that our students live in. Tchudi and Mitchell (1989), however, question this approach by considering what individual students contribute suggesting, “What has consistently often gone wrong in literature

instruction is that programs have consistently ignored the individual experiences and interests that young people bring to reading” (p. 112). English instructional programs persist in ignoring the gap between the worlds the students live in (Prensky, 2006) and settings of the literature students are asked to read. This gap can make reading comprehension difficult, if not impossible, for students whose personal experiences provide little to no prior knowledge for these works.

From at least the 1950s to the present, the English instruction in secondary schools in the United States has centered upon the study of classics in American, British, and world literature, many of which were written 200 years ago or more (Applebee, 1974; Slater, 2004). The language, settings, and social patterns of these works of literature that remain core items in today’s curriculum bear little relation to the world current students inhabit and are difficult for students to connect to in a meaningful way.

Prior Knowledge

Because the contexts of the works of literature that students are expected to read in school are so removed from the worlds in which they live, students possess little prior knowledge of the settings of the literary reading selections they are required to study. This also holds true for the reading selections provided on the ACT exam. One method of addressing this issue is to provide broad reading experiences for students across time periods and genres as is recommended by the National Council of Teachers of English and the International Reading Association (2009). However, students are still confronted with the problem of little or no prior knowledge of the time periods or genres in which these works are set. Duke and Pearson (2005) succinctly describe the problem: “Any text comprehension depends on some relevant prior knowledge” (p. 208).

In fact strategic readers activate prior knowledge before, during, and after reading (Vacca, 2002), which is clearly difficult if prior knowledge is unavailable. Good readers are able to “think about the authors of the text, their style, beliefs, intentions, historical milieu, and so on” and they are able to “draw from, compare, and integrate their prior knowledge with material in the text” (Duke & Pearson, 2005, p. 206). While reading other texts can help students build prior knowledge, hands on activities, excursions, conversations, and other experiences are also needed for the development of vocabulary and concept knowledge that may be required to understand a text (Duke & Pearson, 2005). So, instructional strategies that complement reading comprehension instruction with experiences that build vocabulary and conceptual knowledge may offer promise. Digital game based learning may provide these advantages.

Digital Game Based Learning

Research about reading processes tends to categorize reading into information processing models, which in turn focus on the role of prior knowledge and memory in successful reading, and thus, comprehension (Driscoll, 2000; Glaser, 1984). Researchers of video games find that these games have many of the same narrative qualities of books but force players to take active rather than passive roles in order to participate in the narrative action (Gee, 2003; Shaffer, Squire, Halverson, & Gee, 2005; Squire, 2006). Being successful in the game environment requires the player to “understand the underlying rule systems and how they interact” (Squire, 2006, p. 20) and therefore the player must become actively involved in the game environment. These qualities seem to echo the same virtues and aspirations of active learning as defined by the Tennessee State Department of Education (2008).

Shaffer et al. (2004) suggest that “in virtual worlds, learners experience the concrete realities that words and symbols describe” (p. 4). For readers who find it difficult to engage with print based narrative, playing a video game prior to reading may help make the realities described by words and symbols more accessible. Digital game based learning may be a type of technology integration that can provide prior knowledge experience and in turn will improve reading comprehension.

While playing a video game may offer the type of interactivity and engagement necessary to support instruction, one of the many questions still unanswered with this strategy is to what extent will the knowledge gained in the game generalize. To this end, one of the considerations that must be examined is that of transfer both near and far from the source of the prior knowledge to the target of the instruction. Transfer is defined as the applicability of information learned in one context to another, and is the ultimate goal of instruction (Barnett & Ceci, 2002; Perkins, 1992; Simons, 1999). For the use of digital game based learning to provide prior knowledge to be successful, the knowledge and experience gained from playing the video game must transfer to the study of genre and literature under consideration. Transfer can be divided into two types, near and far with near transfer being knowledge that is retained between analogous tasks while far transfer occurs between remote domains (Barnett & Ceci, 2002; Perkins, 1992). One purpose of using the video game to provide prior knowledge would be to foster near transfer between the game narrative and the similar narratives of the literary texts as all of these experiences are with classic detective fiction. Another purpose of using the video game would be to encourage far transfer between the characteristics of the literary genre of the

video game and the very similar literary genre of the reading selections as both are based on classic detective fiction.

Problem Statement

Although much research has claimed that digital game based learning works, there has been a dearth of studies as to how to actually implement it (Van Eck, 2006). Many calls have been made for mature study of the potential for educational games. In fact, Squire (2006) has identified three areas that need research:

1. critical study of games as participation in ideological systems,
2. learning as performance, and
3. educational games as designed experiences.

Further, a search of the literature has yielded few prior studies utilizing digital game based learning to provide prior knowledge of genre (c.f., Beavis, 2002) or story for reading classic literature. Many researchers stress the importance of prior knowledge in reading (Driscoll, 2000; Duke & Pearson, 2005; Glaser, 1984; Royer, Perkins, & Konold, 1978; Vacca, 2002; Vacca & Vacca, 1989), but few discuss how this knowledge can be provided to less experienced readers (Duke & Pearson, 2005).

The role of digital game based learning has a questionable connotation with many English teachers in terms of its real value as a tool for learning and may be difficult to integrate into existing curriculums (McGrail, 2005). In fact, many English teachers and others feel that technology is responsible for the decay of print literacy and games in particular are held responsible for diverting students from enjoyment of print based literacy (McGrail 2005; Solomon, 2004). However, the definitions of literacy are changing in response to the widespread use of technology by students outside of gaming

because young people inhabit a different world of text (Beavis, 2002; Prensky, 2006). Students are changing along with technology and their expectations for information are pragmatic, visual, interactive and personal; because of many of them are becoming averse to reading, they want more material in less time (Aldrich, 2005). “Most of today’s teachers know little if anything about the digital world of their students – from online gaming to their means of exchanging, sharing, meeting, evaluating, coordinating, programming, searching, customizing and socializing” (Prensky, 2006, pp. 10-11). The disconnect between the literacy students experience at home and the types of literacy that teachers enforce make it difficult for teachers to design instruction that students need (Prensky, 2006). Perhaps the key to bridging the disconnect is to combine the foundational literacy that has shaped education as we know it today with emerging literacy that our students already bring to school. Digital game based learning studies have reported that games have a potential to be powerful tools for learning, the key is to align the potential of games to English teachers’ curriculum aims (Beavis, 2002; McGrail, 2005; Staples, Pugach, & Himes, 2005).

Purpose of the Study

The purpose of the study will be to examine the use of digital game based learning to provide prior knowledge for students who are unfamiliar with the setting, mode of conversation, social customs, and types of characters found in British literature, specifically Sherlock Holmes stories by Arthur Conan Doyle, to increase reading comprehension of the literary selection. The use of digital game based learning to provide such knowledge is innovative. The implementation of gaming in a school environment is not a common educational technique and would be an additional expense for schools to

incorporate in terms of purchasing games and providing hardware to support the games. Proof of efficacy would be necessary to warrant incorporation of such a novel instructional tool into the curriculum.

Research Questions

The research questions and hypotheses for this study are:

1. What are the effects of playing a commercial off-the-shelf video game upon prior knowledge on genre and background of related literary selections?

Hypothesis: Playing a commercial off-the shelf video game will help students develop prior knowledge of the genre and background for a work of literature by anchoring the information about the genre in an inquiry based learning environment (Driscoll, 2000; Gee, 2003; Van Eck & Dempsey, 2002) allowing students to adapt and transform what they learn as they advance in the game and later move to print based narrative.

2. What are the effects of playing a commercial off-the-shelf video game upon prior knowledge and reading comprehension?

Hypothesis: Playing a commercial off-the-shelf video game will help students develop prior knowledge that will facilitate reading comprehension of unfamiliar material by strongly encouraging participation in the action of the narrative (Gee, 2003; Shaffer, Squire, Halverson, & Gee, 2005) thereby giving students resources for future learning and problem solving.

3. Is there a difference in the reading comprehension of near and far transfer of knowledge gained from playing a commercial off-the-shelf video game in regard to the genre of a related literary selection?

Hypothesis: Playing a commercial off-the-shelf video game will affect reading comprehension by improving background knowledge about detective fiction (Duke & Pearson, 2005; Gee, 2003) which in turn will transfer to improved reading comprehension through the mechanism of arousing mindfulness (Perkins, 1992) about detective fiction.

4. Does sequencing of instruction influence near and far transfer of learning for reading comprehension?

Hypothesis: Sequencing instruction will not impact the near and far transfer of learning because the information gained from video game play will be of a general form of detective fiction which is more likely to transfer than if the game were designed to train the students in a specific set of procedures or specific facts (Barnett & Ceci, 2002).

CHAPTER 2

LITERATURE REVIEW

The major purpose of this literature review is to describe the role of prior knowledge in the reading process and how video games can influence prior knowledge through effective technology integration in the secondary English classroom. First, models of reading as information processing, as well as the role of educational gaming in secondary English, will be examined. In addition, the current state of technology integration in the United States will also be appraised. Finally, since this study considers transferring prior knowledge to similar learning and more generalized principles, the processes and conditions of near and far transfer will also be taken into account in this review of literature.

Reading Processes

Early studies into the processes of reading were heavily concerned with the mechanical aspects of reading, such as eye movement studies in the late 19th centuries (Davis, 1968). Horace Mann influenced a movement from the examination of the eye to a fluent oral reading, which eventually declined in the first half of the 20th century (Davis, 1968). Although studies in both of these areas continue today (Fuchs, Fuchs, Hosp, & Jenkins, 2001; Rayner, 1998; Reichle, Rayner, & Pollatsek, 2003; Zutell & Rasinski, 1991), the focus of reading research also moved into broader investigations that made it evident that reading ability depends in part on the recognition of consonants and consonant sound combinations as well as grammar, knowledge of how language works, and the general knowledge that a reader brings to bear when reading (i.e., prior

knowledge). Moreover, it has become clear that reading comprehension among mature readers is not a unitary trait (Davis, 1972).

For instance, recent comprehensive research into the reading process has identified four components of reading: background knowledge, text relationships, comprehension skills, and self control and independence (Vacca & Vacca, 1989). Background knowledge refers to the knowledge structures that readers bring to new reading that allows them to read not only the written lines, but the meanings found “between the lines.” Text relationship points to the importance of the structure of the text imposed by the writer. When readers are able to perceive this structure, learning and retention of the text improve. Comprehension skills involve the act of exploring a text and making meaning. Self control and independence help create motivation to read (Vacca & Vacca, 1989). All four of these components are vital to successful reading and can be encouraged by teachers within classroom settings.

In an examination of 48 models of the reading process, Geyer (1972) noted that most models of the reading process are information processing models which describe one or more manifestations of information flow:

- Extraction and transformation of the information itself
- The identification of the processing systems and their operating characteristics
- The neurological substrata

Geyer (1972) cautioned that many of these models were constructed under laboratory conditions and may not describe what happens in real life situations. However, the prevalent models of the reading process are information processing models.

Cognitive information processing models describe the stages of input and output of information by humans with the aid of the intervening variable of the information processing system of the learner (Atkins, 2003; Driscoll, 2000; Geyer, 1972). In these models, typically there are three stages of the memory system: sensory memory, working memory, and long-term memory. Sensory memory is initiated through the five senses and serves to hold information in memory long enough for it to be processed further. As a person is reading, the letters on the page stimulate pattern recognition and the process of attention can begin to slow processing if a word is unfamiliar. When reading, therefore, information from text enters the first stage of information processing via vision and the speed of processing can be affected by a reader's familiarity with the text or prior knowledge (Driscoll, 2000).

Information then proceeds to working memory, also referred to short-term memory, where it is prepared for long-term memory. At this point, the information is coded and takes on meaning. Word meanings are retrieved from long-term memory, which enables the reader to assemble the meanings of whole sentences. The ability to think about ideas or read and understand phrases is limited and the information being considered will only be available briefly (Driscoll, 2000). In fact, "With very long and complex sentences, for example, the reader has typically forgotten the beginning of the sentence by the time the end of it is reached" (Driscoll, 2000, p. 77). For information to be retained, it has to be encoded and processed into long-term memory. To be successful at retaining the material being read, the reader must make connections with correlated knowledge already stored in long-term memory. Previous knowledge may allow the reader to construct a meaningful image which aids in later recall. The meaning that a

reader gleans from a text is controlled not only by the text itself, but also by the prior knowledge the reader has of the subject matter of the text (Driscoll, 2000).

Prior Knowledge

Prior knowledge, “what students already know about a topic” (Vacca & Vacca, 1989; p. 35), is vital to successful reading (Driscoll, 2000; Glaser, 1984; Royer, et al., 1978; Vacca & Vacca, 1989). The term, prior knowledge, is also frequently referred to as background knowledge and the terms may be used interchangeably. Although reading is not a clear process, it can be described as an active interaction between the reader and the text during which the reader attempts to make sense of what is being read by activating background knowledge and expectations for written language (Vacca & Vacca, 1989). To make sense of text, the reader uses his or her knowledge of how language works, already held general knowledge and the meanings of known words to build meaning which aids in later recall (Vacca & Vacca, 1989). Conversely, individuals with poorly organized prior knowledge may make erroneous connections between prior knowledge and new material (Royer, et al., 1978).

Therefore, effective instruction requires that prior knowledge be extant, and that it is structured effectively. “For instruction to be meaningful and relevant, it must build upon learners’ prior knowledge and help learners to construct cognitive connections between what they already know and what they are being asked to learn” (Driscoll, 2000, p. 79). Providing individuals with effective structure may be accomplished by supplying “overt organizational schemes or by teaching temporary models as scaffolds” (Glaser, 1984, p. 101). Pre-reading instruction to prepare students to read a specific work can help students reduce uncertainty by activating and building background knowledge, which in

turn enables students to improve comprehension (Vacca & Vacca, 1989). “Abilities to make inferences and to generate new information can be fostered by insuring maximum contact with prior knowledge that can be restructured and further developed” (Glaser, 1984, p. 101). Multiple studies have been conducted on the effect of prior knowledge on reading comprehension with varying outcomes (Afferbach, 1990; Dochy, Segers, & Beuhl, 1999), yet the overwhelming conclusion is that prior knowledge has a positive impact on reading comprehension and increases interest and motivation for reading the material being studied (Glaser, 1984).

It is important to remember the configuration of such prior knowledge can determine how helpful prior knowledge can be (Driscoll, 2000; Glaser, 1984; Royer, et al., 1978). Consequently, reading works of literature that were written, in some cases, decades and even centuries before the life experiences of the reader may be especially difficult because of unfamiliar vernacular, settings, social customs, etc. So, establishing prior knowledge can be of critical importance to fostering meaningful interaction between today’s students and classic works of literature and ensuring reading comprehension.

Reading Comprehension

Reading comprehension, the measure of success for reading, can be defined as the act of exploring and making meaning (Vacca & Vacca, 1989). To facilitate comprehension, authors impose structure on text; students that are able to recognize relationships among concepts and propositions are better able to respond to meaning and distinguish important from less important ideas. In fact, without the ability to invoke meaning through the transaction between the reader and the writer, reading cannot take

place. Comprehension skills are highly interactive and cannot be separated and taught as single discrete skills. To make sense of reading, readers work with print by making use of their background knowledge, as well as their expectations for written language. By matching what the reader already knows to new text, readers achieve comprehension (Vacca & Vacca, 1989). The ACT measures reading comprehension so, improving reading comprehension will improve overall reading scores.

Integrating Video Games into Secondary English

Integrating commercial-off-the-shelf video games, also known as digital game based learning (DGBL), into secondary English classrooms is fraught with the same obstacles that other types of technology integration face. Integration of gaming must support appropriate learning theory, meet the needs of English curricula, and sustain the same infrastructure that maintains other technology integration (i.e., computers, networks, Internet connections, etc). To that end, learning theories that support the integration of video games in the classroom will be discussed, followed by an elaboration of the state of educational gaming with connections to secondary English. Finally, a review of the current state of all technology integration in the United States will be undertaken.

Learning Theories and Digital Game Based Learning

Like other educational interventions, integrating digital game based learning should be guided by suitable learning theories such as situated cognition, anchored instruction, or Vygotsky's Zone of Proximal Development (Brown, Collins, & Duguid, 1989; Driscoll, 2000; Gee, 2003). Situated cognition, for example, is defined as learning in a community of practice (Brown, et al., 1989; Driscoll, 2000). Gee (2003) also refers

to this theory as semiotic domains. Novices in communities of practice are often familiar with the rules of practice but have never had to actually apply those rules to realistic situations. If knowing what and knowing how are not integrated, then knowledge remains inert (Bereiter & Scardimalia, 1985) as in the case of novices who are not yet practicing in the field of study.

When reading a text set in unfamiliar social, political, and historical environments, a reader's prior knowledge of vocabulary may not be adequate to enable readers to understand the setting, characters, or the conflict in the story (Driscoll, 2000; Glaser, 1984; Royer, et al., 1978; Vacca & Vacca, 1989). Print-based narratives can allow students to be unreceptive to the information contained within it (Gee, 2003). Video games, however, do not allow players to remain passive and instead situates learners inside the narrative. To play the game, students must participate in the action of the narrative and assume a character's identity (Gee, 2003; Shaffer, et al., 2005; Squire, 2006). Video games "offer designed experiences in which participants learn through a grammar of doing and being" (Squire, 2006, p. 19). Learning from semiotic domains, or situated cognition, in video games allows players to learn to encounter the game-world in new ways, gain some new sense of social interaction with the characters or other players, and gain resources for future learning and problem solving (Gee, 2003; Squire, 2006). Active learning in video games allows students to test their prior knowledge for accuracy by providing them with ongoing feedback in the form of the visual environment, the interactions with other characters and/or players, and in the success or failure of game play. For example, in a study of students playing *Civilization III*, learners were able to reenact the process of European colonization of the western world. During game play,

“For the most part, students interpreted their events in terms of preexisting notions of colonization or geography, but expanded and modified their understandings of colonization in the process of playing” (Squire, 2006, p. 25). In the classroom, games can become sources of critical thinking and learning. This learning opportunity becomes possible when other students and the teacher encourage reflective meta-talk, thinking, and actions in regard to the designs of the game and of related semiotic domains (such as a print-based narrative, or scientific principals, or historical events), and their complex interrelationships (Gee, 2003).

Anchored instruction (Driscoll, 2000) is the use of a context (traditionally in the form of an information-rich video disc) to present an ill-defined problem to a learner that requires inquiry-based learning or the application of previously learned skills to solve it. This context is designed to provide motivation and often a sense of urgency to the learning (Driscoll, 2000). Many computer based games, or video games, allow for anchored instruction through the use of graphics, sound, text, and video which are controlled by the learner via navigational options (Van Eck & Dempsey, 2002). Learning events or anchors are embedded in problem solving environments (Van Eck & Dempsey, 2002) such as the problem solving environment that might be found in a detective or mystery game. A game therefore that is based on a work of literary fiction could provide prior knowledge that would transfer to a print based work because “a simulation game might function similarly to anchored instruction by making use of authentic situated learning” (Van Eck & Dempsey, 2002, p. 25). Video games provide an information-rich environment that requires players to solve problems in an incremental fashion. As players advance in the game, learners face more complex problems whose solutions are

constrained by earlier experience in the game (Gee, 2003). Inside the game environment, the learner is allowed to experiment and make discoveries which in turn lead the learner to transfer what has been learned early in the game to later problems, sometimes adapting and transforming previous learning (Gee, 2003). For prior knowledge to be useful to a reader, it must be structured effectively, yet it must also be monitored for erroneous conclusions (Glaser, 1984; Royer et al., 1978). The environment created by video games allows players to test knowledge brought into the game prior to playing as well as knowledge gained during the game as part of game play.

Video games also encompass Vygotsky's Zone of Proximal Development: a gap between what the learner can already accomplish and what he/she can accomplish with scaffolding (coaching) provided by a more knowledgeable other (Driscoll, 2000). Video games provide scaffolding and coaching specifically when it is needed (Foreman, 2004; Gee, 2003). Further, this information is provided, "when the learner needs it or just at the point where the information can best be understood and used in practice" (Gee, 2003, p. 138). Good games stay at the outer edge of a player's growing sense of competencies so they are challenging but achievable, meeting the requirements of the zone of proximal development (Bedigan, 2007; Gee, 2003). Playing a video game created from print-based literature may supply the overt organizational schemes or a model that can serve as a scaffold that readers need to make effective use of prior knowledge (Glaser, 1984). Simulation, role-playing, narrative games themselves, therefore, have the potential to serve as a scaffold or a coach, providing feedback as a more knowledgeable other would.

Digital Game Based Learning and Secondary English

Special challenges face the integration of DGBL in secondary English classrooms; however if integration is based on curriculum needs, it can be effective (Beavis, 2002; Gee, 2003; McGrail, 2005; Staples, et al., 2005). In fact, many English teachers feel that technology is responsible for the decay of print-based literacy that has traditionally dominated the instruction of secondary English (McGrail, 2005). Indeed, games are held directly responsible as one of many technology innovations that are destroying the language through the abuse of the conventions of English as well as the enjoyment of print-based literacy.

However, the definitions of literacy are changing in response to the widespread usage of technology outside of gaming, because young people inhabit a different world of text (Beavis, 2002). Researchers have reported that games have the potential to be powerful tools for learning; the key, they suggest, is to align the potential of games to English teachers' curricular aims (Beavis, 2002; McGrail, 2005; Staples, et al., 2005).

For example, games allow students to manipulate otherwise unalterable variables, view phenomena from new perspectives, observe a systems behavior over time, pose hypothetical questions, visualize a system in 3D, and compare simulations to their understandings of a system (Squire, 2005). In addition, when implemented in a classroom, the inevitable failure of a player of complex games such as *Civilization* forces students to reexamine gaps or flaws in their understanding of events through recursive cycles of play (Squire, 2005). Typically low achieving students perform well in game-based curriculums, but students who were successful in print-based curricula were uncomfortable with gaming curricula (Beavis, 2002; Squire, 2005). This suggests that

typically successful students may need more exposure to other forms of literacy that currently prevail outside of school settings. Good games cause players to consult a variety of sources for game play including gamer magazines, message boards, software boxes, classmates, game guides, etc (Beavis, 2002; Foreman, 2004). Games provide players with narrative, theme, and plot but in a bottom-up fashion rather than the top-down fashion of print based stories (Bedigan, 2007).

These artifacts of gaming have powerful implications for English teachers in terms of literacy skills and engagement with narrative. In a study of Australian English teachers (Beavis, 2002), researchers set the goal of using commercial-off-the-shelf games as text in expanded literacy. The goal was to integrate games into English courses by having teachers create curricula for the games. Teachers used a variety of video games to extend student understanding of genres of literature being read in class. Students played games cooperatively and took notes as they observed each other play. They read computing magazines, game guides, message boards, software boxes, and game previews. They used these texts for their own writing about the video games. They held debates and group discussions about the merits of the individual games. The teachers reported great satisfaction about the technology integration because it was meeting curriculum needs and typically low-achieving students were highly motivated and participating. The greatest concern of the teachers was the alienation of the typically successful students who were more comfortable in the print-based classroom. Again, however, this type of curriculum integration not only benefited traditionally low-achieving students, but also exposed the typically successful students to expanded forms of literacy found outside the classroom and thus possibly benefited both groups. Though

studies of gaming in English classrooms are rare, this particular study demonstrated the potential that digital game based learning using commercial-off-the-shelf video games has to benefit the English reading program.

Technology Integration

In addition to the unique challenges educational gaming faces in the secondary English classroom, it is also subject to the challenges all technology integration experiences in the United States (Bauer & Kenton, 2005; Becker & Jacobson, 2005; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005; Staples, et al., 2005). To gain a clear picture of the potential for gaming in secondary English instruction, it is important to understand that it is a facet of technology integration and the challenges of implementing it are in line with the complications of any other technology integration (Becker & Jacobson, 2005). Furthermore, digital game-based learning is still a relatively new concept in technology integration circles. Because gaming has such questionable connotations with many English teachers in terms of its real value as a tool for learning, it may be even more difficult to integrate into existing curriculums (McGrail, 2005). English teachers have reported a lack of critical literacy skills necessary for students to discern good sources of information from inaccurate ones and this is partially attributed to the Internet and other technologically based information. These teachers perceive a dearth of software titles that relate to their subject matter. In addition, English teachers do not perceive significant benefits to incorporating technology of any sort into their classrooms (McGrail, 2005). These teachers report frustrations at the lack of adequate equipment to perform most technology-based lessons and fail to see a direct connection to the curriculum that they teach (McGrail, 2005). Moreover, to really make the

integration of any technology meaningful and relevant, it is important to consider the learning theories that support it and utilize them appropriately (Judson, 2006). To that end, the current state of technology integration in the United States will be discussed.

Although many of the goals for technology integration have been met in terms of the ratio of computers to students, or widespread access to the Internet, there seems to be a general consensus that teachers are not really integrating technology into their curriculums at the level that most researchers anticipated (Bauer & Kenton, 2005; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005; Staples, et al., 2005). That is not to say that teachers are not using technology for keeping records, accessing lesson plans, creating study guides, communication with parents, or creating PowerPoint presentations instead of notes on the chalkboard. But technology use does not really seem to be affecting the everyday schooling experiences of the average U.S. student (Bauer & Kenton, 2005; Grant & Mims, 2009; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005). The typical usage of computers in school settings for students is in the form of composing reports and conducting research (Judson, 2006) but most teachers are only integrating technology into their daily lesson occasionally or less (Bauer & Kenton, 2005; Grant & Mims, 2009).

Although most teachers who respond to surveys and volunteer for research studies have positive attitudes about integrating technology, many of them report significant barriers to actually implementing it (Bauer & Kenton, 2005; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005; Staples, et al., 2005). Barriers that teachers and researchers have identified are consistent across research studies and include problems with equipment, student skill levels, scheduling, software issues, logistics, access to technical

support, and novice-level implementation of educational theories that support integration techniques. Although equipment is more widely available, many teachers report that equipment is (a) mismatched in terms of computer platforms, such as Macintosh and Windows, and (b) often antiquated and therefore not adequate for the functions teachers require of them (Bauer & Kenton, 2005; Becker & Jacobson, 2005; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005).

Students are also at varying skill levels with regard to technology, so to teach a technology integration lesson often means teachers have to spend instructional time teaching students basic technology skills rather than English-related objectives (Bauer & Kenton, 2005; McGrail, 2005). Scheduling issues cause many teachers to abandon plans for technology integration when the primary access to computers is through lab settings, because many teachers cannot schedule the labs to meet timeframes of curriculum needs (Bauer & Kenton, 2005). Even in technology rich schools, teachers' decisions about student software use are directly related to the ratio of computers to students (Palak & Walls, 2009). Logistically, many teachers find the extra time that is required for students to report to the lab rather than the classroom, set up the computers for each student as he/she arrives, troubleshoot miscellaneous problems that impede computer usage, and finally shut down computers and prepare the lab for the next class so time consuming per lesson that it diminishes the value of using technology with lessons (Bauer & Kenton, 2005; McGrail, 2005).

In addition to the aforementioned challenges of technology integration, teachers lack access to technical support; the equipment that is available is not maintained and serves as the cause of a great deal of student frustration (Hernandez-Ramos, 2005;

McGrail, 2005). Technical support and general school support does increase the likelihood of certain types of software use such as web publishing by teachers (Palak & Walls, 2009). But, teachers also report a need for more teacher-training and for software that is appropriate for use at the secondary level (Bauer & Kenton, 2005; McGrail, 2005).

Additionally, although many researchers report that the constructivist philosophies of teachers increase the likelihood of technology integrations (Judson, 2006), integration rates are still lower than expected. This may be due to the fact that though most teachers surveyed report a constructivist mindset with regard to teaching, most teachers implement these theories at a novice level (Judson, 2006; Palak & Walls, 2009). The teachers only considered the surface features of these philosophies when creating lessons, such as cooperative learning, rather than deeper features of instruction, such as students learning from each other during cooperative learning. Thus, teachers do not realize the full benefits of combining technology integrations with constructivist practices and so do not use integration lessons frequently (Judson, 2006; Palak & Walls, 2009). Rather, technology is implemented in ways that supports teacher-centered approaches (Gao, Choy, Wong, & Wu, 2009; Palak & Wells, 2009). More recent research suggests that although pre-service teachers come into teacher preparation programs with deep seated beliefs about technology integration based upon their own personal prior educational experiences, these beliefs may be influenced by teacher education programs (Bai & Ertmer, 2009). Participation in educational technology classes as well as enrollment in courses whose instructors demonstrate pedagogically sound practices, such as learner centered instructional practice with regard to technology integration, may

positively impact pre-service teachers' future decisions about how and when to integrate technology in their own classrooms (Bai & Ertmer, 2009).

A debate seems to exist in the literature as to the effect that age and years of teaching experience may have upon a teacher's aptness to integrate technology (Hernandez-Ramos, 2005; Inan & Lowther, 2009; Shrumm, Shelley, & Miller, 2008; Staples, et al., 2005). While teachers may enter the field at any age, many veteran teachers report that they did not experience technology integration classes in college (Hernandez-Ramos, 2005). Teachers who did not experience technology integration classes as students themselves may have less proficiency with computers regardless of age (Inan & Lowther, 2009). Therefore increased age has an indirect influence over readiness to integrate because older students are entering the educational field. On the other hand, veteran teachers are often less ready to integrate because of lower proficiency with computers because of lack of exposure to technology preparation coursework (Inan & Lower, 2009). However, other researchers contend that teachers with more years of teaching experience (and so less likely to have experienced technology integration as a student themselves) were more willing to integrate technology than first-year teachers. This may be because teachers who integrate technology have to juggle multiple levels of expertise in navigating between curriculum and technology (Shrumm, Shelley, & Miller, 2008; Staples, et al., 2005). Therefore, more experienced teachers are less intimidated by the challenges posed by managing the technology in addition to the other facets of classroom management.

In a study of three elementary schools that received simultaneous technology grants, researchers identified three trends that had significant impact on the degree of

success of integration efforts: integration efforts have to be curriculum-based, a formal structure needs to be in place for technology-using teachers to share expertise and coach peers, and technology equipment needs to be chosen with curriculum goals in mind (Staples, et al., 2005). These three requirements have a direct relationship to the attitudes of English teachers and the use of technology in the classroom and specifically digital game-based instruction in the classroom.

Transfer

Finally, transfer of learning, which can be defined as the applicability of information learned in one context to another, is the ultimate goal of instruction (Barnett & Ceci, 2002; Perkins, 1992; Simons, 1999). Three kinds of transfer take place as the result of learning in various situations: prior knowledge to learning, learning to new knowledge, and learning to application (Simons, 1999). Further, transfer can be divided into two types, near transfer and far transfer. Near transfer can also be thought of as analogical transfer – training on one task is followed by testing on a novel task that is an analogue. Usually transfer takes place when learners acquire a deep understanding of the lesson rather than just surface learning (Barnett & Ceci, 2002; Perkins, 1992). Far transfer, on the other hand, occurs between domains and when the contexts of the domains seem remote from each other (Barnett & Ceci, 2002; Perkins, 1992). Far transfer may be more successful for general deep principles than for specific superficial facts or procedures.

Far transfer is difficult to identify and quantify but is yet the goal of most training. For example, learners may have to transfer learning measurement from school into use for cooking at home. Barnett and Ceci (2002) reviewed 100 years of research that

specifically claimed to substantiate far transfer. Their purpose was to devise a taxonomy that would clearly mark when far transfer had occurred. In their wide-ranging review, they ascertained two main factors that measure the success of transfer: content and context (Barnett & Ceci, 2002). Content has three dimensions: the specificity-generality of the learned skills, the nature of the performance change, and the memory demands of the task. Specificity-generality of the task refers to whether the content of the learning is a specific fact or a routine procedure; a form of representation or a more general problem-solving heuristic or principle. The content of the learning can exist in a continuum from specific to general information, and gradations are possible. The more general the form of the information, the more likely the information is to transfer to a new context. Performance change applies to speed of performance, degree of accuracy, and/or doing the right behavior. Memory demands concern whether learners are required to execute the learned activity prompted by hints or if they have to also choose the correct approach unaided. Transfer usually proceeds more smoothly when cues are allowed for learners as is usually the case in the classroom.

Context pertains to when and where the learning is transferred from and to, and it can be divided into six domains: knowledge, physical, temporal, functional change, social context, and modality (Barnett & Ceci, 2002). Knowledge is the knowledge base to which the skill is to be applied, for instance, English class vs. History class. The challenges associated with the knowledge context are in defining distance and thus defining far context. Physical context involves the physical conditions, such as whether training and transfer phases are conducted at school or at home, in the exact same room, or with the same experimenter. Temporal context is the elapsed time, or delay, between

training and testing. Functional context refers to the function for the skill and the mindset evoked in the individual. For instance, the information may be for transfer to an academic activity or to the “real world” in the form of a test or an activity embedded in daily activity. Problem solving tools for one purpose may not transfer equally well to another. Social context describes whether the task is learned or performed alone or in collaboration with others. And finally modality is divided into two aspects, macro and micro aspects. At the macro level, the focus is on the mode of the assignment: visual or auditory, written or verbal, linguistic or hands-on, etc. At the micro level, the focus is on the design of the assignment such as multiple-choice or essay, and so on (Barnett & Ceci, 2002).

To determine if far transfer has occurred, it is pertinent to look at the domains in which the learning occurred and to compare-contrast that domain to the domain in which the transfer takes place to determine how alike or different the domains are. In their review of research, Barnett and Ceci (2002) noted that the domain to which the learning was transferred was more successful in receiving transfer when it was already somewhat familiar to the learner. Also, general heuristics and principles seemed to transfer more easily than specific learning. Intuitively, this makes sense. The more context-dependent knowledge is, the less likely it will be able to be transferred to another context. In fact, this is one of the assertions to situated learning. However, critics of situated cognition (e.g., Anderson, Reder, & Simon, 1996) argue there is significant evidence to support the transfer of learning from school to work environments.

Not only are content and context important, the conditions of transfer should be met to facilitate effective transfer rather than just ordinary learning (Perkins, 1992). The

difference between transfer and ordinary learning is marked by an assumption: When learning takes place in a particular context, say a classroom, it will impact behavior/performance beyond that context and thus constitute transfer. The first condition is extensive practice in a variety of contexts. The next condition is the ability of the learner to abstract critical attributes of the scenario or concept being studied (Perkins, 1992). Meta-cognitive reflection is the third condition of transfer which involves focusing the thinking of the learner on the actual thinking process engaged while learning. Arousing mindfulness is another condition of transfer and it is met by sustaining a generalized state of alertness to the learning activities as well as to the environment in which the learning is taking place. This condition has the additional benefit of facilitating explicit abstraction and meta-cognitive reflection. Finally, the last condition of transfer is using a metaphor or analogy to represent new material being studied in light of prior knowledge. An example of this would be to use the solar system as an analogy for an atom. Since, unfortunately, transfer often does not take place, especially far transfer, it is important that the conditions which facilitate transfer be considered when designing instruction (Perkins, 1992).

Summary

In summary, reading is a cognitive process that is greatly benefited when readers bring prior knowledge about the topic, setting, characters, and other information incorporated in the literary work to bear while reading (Driscoll, 2000; Glaser, 1984; Vacca, 2000; Vacca & Vacca, 1989). Because the world of literacy is changing rapidly and the pace of change makes experiences of just 60 years ago difficult for adolescent students to envision today, it is important that students are able to bridge the gap between

the world they inhabit and the worlds depicted in classic literature. The plots of these classic stories remain compelling though the medium of the setting of many of the novels makes them inaccessible to teenagers who live in a culture of rapidly evolving technology (Prensky, 2006; Tchudi & Mitchell, 1989). It is critical to students and schools that reading comprehension be maintained and improved in order to meet college entrance requirements, i.e. the ACT, and the needs of industry to keep our country competitive (Achieve Inc., 2009). Technology integration through the incorporation of commercial off the shelf video games based on classic literature may be an effective way to bridge the divide between traditional classic literature and the digital world that most adolescents inhabit if the knowledge gleaned during play can be transferred as prior knowledge during the reading process. To be effectively integrated, these games must be incorporated through appropriate models of instruction (Gee, 2003; Shaffer, et al., 2005; Squire, 2006; Van Eck & Dempsey, 2002) with current realities of K-12 technology integration in mind (Bai & Ertmer, 2009; Grant & Mims, 2009; Inan & Lowther, 2009; Palak & Walls, 2009) and under conditions that will promote transfer from the game to the text.

CHAPTER 3

METHODOLOGY

Participants

The experimental participants were 37 sophomore English students who ranged in age from 14-16. Male and female students were included. African American and Caucasian students made up the majority of the population; however, Hispanic, Asian, and Native American students were also included.

The control group consisted of 15 sophomore English students who ranged in age from 14-16. Male and female students were included. African American and Caucasian students made up the majority of the population; however, Hispanic, Asian, and Native American students were also included.

Twenty-seven (50%) of the participants were inclusion students, meaning these students receive special education services but are placed in general education classes with general education students rather than resource English. Because the setting of the study was a co-teaching classroom, both a regular education highly qualified English teacher and a highly qualified Special Education teacher taught the classes. Although the inclusion students receive modifications, the goal of the co-teaching program was to enable all students in the class to perform at grade level. For the purposes of this study, the English teacher performed the teaching components of this study.

These students were in intact groups and were not randomized for the purposes of this study. The treatments were assigned to the groups without consideration for the composition of the classes but rather based upon class sizes.

Context

All students attended an urban Title I high school in the Mid-South that has an ethnically mixed population. Of the entire school population, approximately 5 % were Asian, Native American, or Hispanic. Of the remaining students, about 65 % were African American, and 30 % were Caucasian. The students all had the same English teacher in addition to a co-teacher who was a Special Education teacher. The role of the Special Education teacher was to ensure that appropriate modifications were in place for the inclusion students. Under normal conditions, the Special Education teacher performed some teaching duties, but the English teacher was the instructor of record. The teacher of record was the lead teacher and an English teacher for the first year this year. Previously, he had served as the co-teacher (Special Education teacher) in an English co-teaching team. He served as a co-teacher in sophomore English for 4 years prior to this year. He taught 4 periods of sophomore English, all of which were co-teaching classes and all of which were represented in this study. This was the first year for his co-teacher to work at this school. She taught all four periods of English with him. This was also her first year to teach English. Prior to this school year, she taught 3 years of middle school physical science in a neighboring school system and three years as a pull-out special education teacher in Georgia. Their first period class had 19 students, 2nd period had 13 students, 3rd period had 24 students, and 6th period had 26 students. First and second period students were combined to create Group A, third period was group B, and 6th period was the control group. The assignment to treatment groups was based upon numbers, not upon class composition.

Course and Instructional Unit

Students enrolled in this course were assigned to high school sophomore English. They were pursuing a study of world literature, grammar, and writing skills. Incorporated into the course were a number of grammar and reading skills that were assessed at the end of the year by end-of-course testing that has been newly aligned to ACT testing standards to meet the new Tennessee Diploma Project graduation requirements. In addition, students were required to write a comparison/contrast paper during the program of this English class. The teacher followed a newly developed system-wide pacing/curriculum guide that delineates the course of study month-by-month for all sophomore English students.

The instructional unit that was the subject of this study is about detective fiction. Students studied the genre of detective fiction itself and considered two examples of detective fiction, *The Hound of the Baskervilles*, a novel about the iconic Sherlock Holmes, and *Murders in the Rue Morgue*, a short story by Edgar Allen Poe and the first detective story ever published. Students compared and contrasted the two detectives, the two crimes and the two sidekicks of the detectives. They also studied relevant vocabulary necessary for the students to comprehend both stories. In addition, students critiqued the two stories as relevant examples of detective fiction. Both of these stories were written by Victorian era writers and are set in Victorian Europe.

This unit met several SPIs for sophomore English including:

- SPI 3002.8.4 Identify and analyze how the author reveals character (i.e., what the author tells us, what the other characters say about him or her, what the character does, what the character says, what the character thinks);
- SPI 3002.8.7 Determine the impact of setting on literary elements (i.e., plot, character, theme, tone.);
- SPI 3002.8.12 Locate words or phrases in a passage that provide historical or cultural cues;
- SPI 3002.2.3 Distinguish between a critique and a summary. In addition the research focus for sophomore English is upon comparison/contrast.

The vice-principal for this school had further made it mandatory that the research paper not only be comparison/contrast but that it also is a type of literary criticism in nature.

The intervention implemented was a commercial off the shelf video game:

Sherlock Holmes and the Secret of the Silver Earring. This game was a point and click adventure game in which students played as Sherlock Holmes and Dr. Watson in a plot that is similar to the spirit of Sir Arthur Conan Doyle's detective stories. The investigation during game play took place in 40 different 19th century London locations. During play, students interrogated 40 witnesses and engaged in programmed dialogue with other non-player characters. Programmed dialogue was conversation between the player and other non-player characters that took place at predetermined plot points within the game narrative. The player could choose to engage in the dialogue to obtain clues or not, but the dialogue was programmed and not random. The player had a predetermined list of questions he/she could ask which the non-player character would answer with pre-

programmed dialogue when the player had achieved objectives that made the dialogue appropriate. For example, the player could not talk at all to certain characters until the murder took place in the game, at that point conversation with specific characters was about witnessing the murder. Later, upon discovering specific clues, conversation with the same characters would be about other plot points that had become relevant as a result of discovering the clues. At the end of each level, players/students considered evidence gathered during their investigation and answered questions posed by Sherlock Holmes. Upon completion of the game, Sherlock Holmes explained the solution to the case.

Students played this game to gain familiarity with the genre of detective fiction and more specifically with the characters and typical plots and settings of Sherlock Holmes detective stories. Research about the reading process reveals that it is an information processing cycle wherein information about new text is matched to what the learner already knows and then is processed and stored (Driscoll, 2000; Geyer, 1972). The success of this process is greatly affected by the reader's prior knowledge of the subject matter (Driscoll, 2000; Royer, et al., 1978; Vacca & Vacca, 1989). In fact, readers with poorly organized prior knowledge may make invalid connections between prior knowledge and new material (Royer, et al., 1978). So, pre-reading instruction can play a vital role in the success of student reading by helping students reduce uncertainty through activating and building background knowledge (Vacca & Vacca, 1989). This prior knowledge may take the form of temporary models or scaffolds (Glaser, 1984). Playing a commercial-off-the-shelf video game based on classic literature may provide a temporary model of the genre and the literary elements of a particular type of literature and therefore serve to build appropriate prior knowledge. Classic literature may be set in time periods

and social milieu that are so far removed from the experience of the student that print-based narratives can allow students to be unreceptive to the information contained within it (Gee, 2003). Video games, however, do not allow players to remain passive. Rather, to play the game, students must participate in the action of the narrative and assume a character's identity. Learning in video games allows players to learn to encounter the world in new ways, gain some new sense of social interaction with the characters or other players, and gain resources for future learning (Gee, 2003; Shaffer et al., 2005). Therefore, playing the video game served as pre-reading instruction the purpose of which was to activate and build prior knowledge to facilitate reading of what was to the students, new material.

A number of steps were taken to integrate the commercial off the shelf game into the class curriculum in order to connect the game play to the content (Charsky & Mims, 2008):

- First the teacher played the game to become familiar with it.
- The researcher created a specialized game guide for the use of the teacher and the students to assist game play.
- The software was installed in a PC computer lab that the teacher had ready access to on campus.
- Students were given adequate time during class to play the game. Initially students played the game for 6 to 10 consecutive days of class time. Play was supported by guidance from the teacher who had a game guide in order to shorten the amount of time required to play the game.

- As students played the game, instructional activities that connect the game to the reading selections were implemented by the teacher. These activities followed the three stages of instructional activities recommended by Charsky and Mims (2008):
 - Type I activities: Journal entries about what happens during game play
 - Type II activities: compare/contrast the game to the literary selections
 - Type III activities: critique the game as a model of detective fiction

Instrumentation

Four types of data were collected: (a) demographics, (b) reading ability score, (c) pretest score, and (d) posttest score. The Kaufman Test of Educational Achievement Brief Form measured the reading ability score, and the pretest and posttest scores were measured with a knowledge assessment of genre and reading comprehension.

Demographics

Data was collected regarding the gender and ethnicity of each student. Also, data was collected to identify whether each student was receiving special education services in English.

Kaufman Test of Educational Achievement Brief Form

The Kaufman Test of Educational Achievement (KTEA) Brief Form 1998 was given to each student one-on-one to ascertain each student's reading level. A global sample of reading ability was obtained from this testing and a reading level was determined for each student. The test was an individually administered assessment of

school achievement. It was valid for grades 1-12 and offers age-based norms for 6 years to 18 years 11 months, as well as grade-based norms. The duration of the test for grades 9-12 averages 25 to 35 minutes for the entire test in Math, Reading, and Spelling. For the purposes of this study, only the Reading portion was administered, so the testing time was significantly shorter. The test was administered by utilizing an easel on which the testing material is visible to the student on one side, and the proctor's prompts were visible to the proctor on the other side. An Individual Test Record sheet was used to record each student's response to the test items and then used to profile the student's score. The reading test contained 52 items and assessed the decoding of printed words and reading comprehension. The student not only read some items to test for letter recognition and pronunciation but also responded orally and physically to written commands in order to indicate comprehension. An advantage to using an individual assessment over a group assessment was that the individual test allowed the examiner to motivate the taker to perform to the best of his/her ability and thus gain a more valid score. The KTEA Brief Form was self reported as a reliable, valid instrument for measuring school achievement that is appropriate for research studies (Kaufman & Kaufman, 1998). The KTEA was chosen because it was already utilized by the target school and the school system the school situated within and was readily available. Both of the teachers in the target class were certified in Special Education and were qualified to administer the test. In addition, this test provided standard scores with a set mean of 100 and utilized standard deviations of 15 with a reliability coefficient of .85 for 10th grade students. Further, the KTEA has been implemented in numerous studies to

establish reading and achievement levels (Bellinger, Stiles, & Neddleman, 1992; Evans, Floyd, McGrew, & Leforge, 2002; Lazarus & Callahan, 2000).

Knowledge Assessment of Genre and Reading Comprehension

The pretest and posttest was composed of 27 questions, composed of three portions (see Appendix A). Seven questions were focused on the genre of detective fiction (items 1–7). In addition, 10 questions (items 1–10) addressed chapters 2 and 3 from *The Hound of the Baskerville*, a detective novel by Arthur Conan Doyle featuring the detective Sherlock Holmes, and 10 questions (items 1–10) were concerned with *Murders in the Rue Morgue* written by author Edgar Allen Poe. In order to mimic the type of questions asked on the ACT, the content of the questions were tested for specific details and facts, drawing inferences, understanding character, point of view, and cause and effect in a multiple choice format. The test was designed by the researcher based on the test of reading comprehension of literature on the Prose Reading portion of the ACT exam. Some questions were adapted from source material about detective fiction (Harris, 1979). To further ensure the validity of the questions, I interviewed a professor of detective fiction at Christian Brother University and edited the questions based upon her review and recommendations.

The pretest was used to determine the prior knowledge of the students of the genre and of the two reading selections prior to playing the game or reading the two texts. At the end of the treatment period, the same test was administered again as the posttest. The researcher scored the pre/post tests using a Scantron scoring machine.

Procedures

The procedures for each group (see Table 1 below) in this study were organized by the following: prior to the intervention, during the intervention, and after the intervention (see Table 2 below). Students were divided into 3 groups for data collection, Control, Group A, and Group B (see Table 3 below).

Table 1
Comparison Groups and Data Collection

Group	Data collection prior to treatment	Testing	Treatment	Testing
Group A	<ul style="list-style-type: none"> • Demographics • Kaufman Test 	Pretest	<ol style="list-style-type: none"> 1. Play video game 2. Read <i>Hound of the Baskervilles</i> 3. Read <i>Murders in the Rue Morgue</i> 	Posttest
Group B	<ul style="list-style-type: none"> • Demographics • Kaufman Test 	Pretest	<ol style="list-style-type: none"> 1. Play video game 2. Read <i>Murders in the Rue Morgue</i> 3. Read <i>Hound of the Baskervilles</i> 	Posttest
Control	<ul style="list-style-type: none"> • Demographics • Kaufman Test 	Pretest	<ol style="list-style-type: none"> 1. Read <i>Hound of the Baskervilles</i> 2. Read <i>Murders in the Rue Morgue</i> 	Posttest

Prior to the Intervention

Students and parents signed consent permission forms that informed both groups of the educational purposes for playing the game and permitted the researcher to gather relevant data including gender, ethnicity, special education status, and reading level via the KTEA. All students were tested to determine reading ability prior to the start of the study to prevent confounding effects that might result from reading abilities that are above or below that of the norm for the group. All of the participants were taught by the

same teacher to minimize variances in the possible influence of the teacher upon the effectiveness or lack of effectiveness of the intervention.

During the Intervention

Group A and Group B played a commercial-off-the-shelf video game, *The Adventures of Sherlock Holmes and the Secret of the Silver Earring*. While playing the game, the students maintained a journal, or a detective's notebook, logging what occurred during game play each day. Students spent 6-10 days playing the game.

After the intervention

All students studied a unit on detective fiction guided by the classroom teacher. The teacher introduced the detective fiction genre, provided background information about the two authors, and facilitated the reading of the two literary selections: an excerpt from *The Hound of the Baskervilles*, consisting of Chapters 2 and 3 of the novel and the short story *The Murders in the Rue Morgue* with a small portion of the exposition of the story omitted. In an interview with the teacher, he identified several strategies that he typically employs to facilitate reading comprehension including Think Aloud Strategy wherein he stops during the reading and asks questions to help students make connections to materials that has to be inferred such as theme and characterization; Retellings Strategy in which he stops during reading and has the students summarize what they have been reading; and Text Reformulation Strategy where he has his students take a section of a story and paraphrase it in writing or orally or has his students take the place of a character and write a letter to other characters in the story (Beers, 2000). He also employed a variety of graphic organizers. Reading comprehension strategies typically utilized by the teacher were incorporated as he diagnosed a need for them. Students

studied relevant vocabulary and wrote a comparison/contrast essay about the two reading selections and the video game. Far transfer was examined by determining if students were able to extrapolate the elements of the genre of detective fiction through playing the video game. Students also wrote a critique of the video game analyzing it as a valid example of the detective genre or not. Once the instruction is complete, the posttest was given to the students.

The experimental groups pursued two different schedules of study in order to examine the possible effect of near and far transfer of the intervention, a commercial off the shelf video game. Near transfer was considered by controlling the order in which the reading selections are administered. After playing the game, Group A read an excerpt, which consists of chapters 2 and 3, from *The Hound of the Baskervilles* and then the short story *Murders in the Rue Morgue*. Group B, on the other hand, played the game, then read the short story *Murders in the Rue Morgue* and then chapters 2 and 3 from *The Hound of the Baskervilles*. Some of the game play occurred as the students in both groups read their literary selections to meet the instructional/scheduling needs of the teacher. Relevant vocabulary instruction was also included to facilitate reading. Upon completion of the game and instructional activities, the participants concluded their participation in the study by taking the posttest. The entire process from pretest to posttest took approximately 4 weeks. The KTEA was administered prior to the pretest as instructional time allowed the teacher and the participants convenient opportunities for testing.

Table 2
Data Collection Procedures

Prior to Intervention	<ul style="list-style-type: none"> • Complete Consent Form • Take reading level test
During Intervention	<ul style="list-style-type: none"> • Take Pre-test • Play the game
After Intervention	<ul style="list-style-type: none"> • Complete the instructional unit • Take the posttest

Table 3
Participants and Procedures

Group	Procedures
Group A	<ul style="list-style-type: none"> • Consent forms signed • Take reading level test (KTEA) • Take pre-test • Play <i>Sherlock Holmes and the Silver Earring</i> • Read excerpt from <i>The Hound of the Baskervilles</i> • Read <i>Murders in the Rue Morgue</i> • Complete all instructional activities • Take posttest
Group B	<ul style="list-style-type: none"> • Consent forms signed • Take reading level test (KTEA) • Take pre-test • Play <i>Sherlock Holmes and the Silver Earring</i> • Read <i>Murders in the Rue Morgue</i> • Read excerpt from <i>The Hound of the Baskervilles</i> • Complete all instructional activities • Take posttest
Control Group	<ul style="list-style-type: none"> • Consent forms signed • Take reading level test (KTEA) • Read excerpt from <i>The Hound of the Baskervilles</i> • Read <i>Murders in the Rue Morgue</i> • Complete all instructional activities • Take posttest

Analysis

The results were analyzed using a series of inferential statistical tests. Analysis methods and data are organized by the research questions (see Table 8).

Research Question 1: What are the effects of playing a commercial off the shelf video game upon prior knowledge on genre and background for a work of literature?

A repeated measures analysis of variance (ANCOVA) was used to analyze the data from Research Question 1. Posttests scores from the control group were compared to the posttest scores for Groups A and B together on the test questions about genre. The scores from the KTEA were used as a covariate for the analysis of this data. The potential benefit of the repeated measures ANCOVA with covariate in this situation was the ability of the researcher to adjust for preexisting conditions that may exist in the treatment groups prior to the research and an increase in precision of the research in reducing error variance (Hinkle, Wiersma, & Jurs, 2003).

Table 4

Data Alignment for Research Question 1

Research Question 1	Variables	Data Sources
What are the effects of playing a commercial off the shelf video game upon prior knowledge on genre and background for a work of literature?	Video game	Reading test score
	Prior knowledge	Posttest scores
		Repeated measures ANCOVA with covariate (i.e., KTEA)

Research Question 2: What are the effects of playing a commercial off the shelf video game influence prior knowledge and reading comprehension of a work of literature?

Research Question 2 was also analyzed by a repeated measures ANCOVA in which the pretests and posttests from the control group and the pretests and the posttests from Groups A and B combined together on the questions about the two stories will be compared using the KTEA as a covariate.

Table 5

Data Alignment for Research Question 2

Research Question 2	Variables	Data Sources
<i>What are the effects of playing a commercial off the shelf video game upon prior knowledge and reading comprehension of a work of literature?</i>	Video game	Posttest from control group
	Prior knowledge	Posttests from Group A + Group B
	Reading comprehension	KTEA
		Pretest scores from all groups
		Repeated measures ANCOVA with covariate

Research Question 3: Does background knowledge about genre and background transfer from playing a commercial off-the-shelf video game and thereby improve reading comprehension?

A dependent *t*-test was used to consider Research Question 3. The mean differences scores from the posttest scores for Groups A and B about *The Hound of the Baskervilles* were compared to the mean differences scores from the post test scores for Groups A and B about the *Murders in the Rue Morgue*.

Table 6

Data Alignment for Research Question 3

Research Question 3	Variables	Data Sources
<i>Does background knowledge about genre and background transfer from playing a commercial off-the-shelf video game and thereby improve reading comprehension?</i>	Video game	Mean differences of posttest scores for Group A and Group B for <i>The Hound of the Baskervilles</i>
	Reading comprehension of near and far transfer of knowledge	Mean differences of posttest scores for Group A and Group B for <i>Murders in the Rue Morgue</i>
		Dependent <i>t</i> -test

Research Question 4: Does sequencing of instruction impact near and far transfer of learning for reading comprehension?

Finally, Research Question 4 was analyzed by comparing the mean differences scores of the posttest scores for Group A to the mean differences scores of the posttest scores for group B on the *Murders of the Rue Morgue* with an independent *t*-test. Then, the mean differences scores of the posttest scores for Group A to mean differences scores of the posttest scores for group B on *The Hound of the Baskervilles* were also analyzed with an independent *t*-test.

Table 7

Data Alignment for Research Question 4

Research Question 4	Variables	Data Sources
<i>Does sequencing of instruction impact near and far transfer of learning for reading comprehension?</i>	Sequencing of instruction	Means of posttest scores for Group A and B for <i>Murder in the Rue Morgue</i>
	Near and far transfer of learning for reading comprehension	Means for posttest scores for Group A and Group B for <i>The Hound of the Baskervilles</i>
		ANCOVA

Table 8

Research Questions and Analysis

Research Questions	Variables	Data Sources	Analysis
RQ1: What are the effects of playing a commercial off-the-shelf video game upon prior knowledge on genre and background of related literary selections?	Independent: video game	Compare post tests between control group and groups A/B on questions about genre.	Repeated measures ANCOVA
	Dependent: prior knowledge		Covariate = Kaufman Test
RQ2: What are the effects of playing a commercial off-the-shelf video game upon prior knowledge and reading comprehension?	Independent: video game	Compare post tests between control group and groups A/B (treatment groups) on questions about the stories.	Repeated measures ANCOVA
	Dependent: prior knowledge, reading comprehension		Covariate = Kaufman Test

(table continues)

Table 8 (Continued)

Research Questions	Variables	Data Sources	Analysis
RQ3: Is there a difference in the reading comprehension of near and far transfer of knowledge gained from playing a commercial off-the-shelf video game in regard to the genre of a related literary selection?	Independent: video game Dependent: reading comprehension of near and far transfer of knowledge	Compare post tests between groups A/B about Sherlock Holmes story and groups A/B about Poe story.	Dependent <i>t</i> -test of mean difference scores Test @ time 1 compared to Test @ time 2 <i>Hound of the Baskervilles</i> only Test @ time 1 compared to Test @ time 2 on <i>Murder in the Rue Morgue</i> only Compare <i>Hound of the Baskervilles</i> to <i>Murder in the Rue Morgue</i>
RQ4: Does sequencing of instruction influence near and far transfer of learning for reading comprehension?	Independent: sequencing of instruction Dependent: near and far transfer of learning for reading comprehension	Compare post tests for group A and group B for the Poe story. Compare the post tests for group A and group B for the Sherlock Holmes story.	Independent <i>t</i> -test to compare Means

CHAPTER 4

RESULTS

The variables included in the data analysis were:

- An estimate of reading ability as determined by the KTEA
- The initial estimate of prior knowledge of genre as determined by a pretest
- The initial estimate of prior knowledge of *The Hound of the Baskervilles* as determined by a pretest
- The initial estimate of prior knowledge of *The Murders in the Rue Morgue* as determined by a pretest
- The follow-up estimate of knowledge of genre as determined by a posttest
- The follow-up estimate of knowledge of *The Hound of the Baskervilles* as determined by a posttest
- The follow-up estimate of knowledge of *The Murders in the Rue Morgue* as determined by a posttest

The first step taken in analyzing the data was the production of descriptive statistics for the scores on the tests that were administered. In addition, two inferential tests were conducted on the data: repeated measures ANCOVAs and dependent *t*-tests. The results will be organized in this order.

Descriptive Statistics

The initial step in the data analysis was the construction of frequency tables to describe the participants and the data obtained from the estimate of reading ability as well as the initial estimates and follow-up estimates for genre, *The Hound of the Baskervilles*,

and *The Murders in the Rue Morgue*. The data will be provided in the aforementioned order in the discussion that follows.

Table 9 depicts the mean Kaufman Test of Educational Achievement (KTEA) score which also designates the mean reading level. The range of scores for the KTEA was 0 to 52 which indicated reading levels of less than 1.0 to above 12.9. The range of scores on the KTEA for Group A was 27 to 44 which indicated reading levels from 3.0 to 11.3. The mean KTEA score for Group A was 36.22 which indicated a mean reading level of 5.5. The range of scores on the KTEA for Group B was 28 to 46 which indicated reading levels from 3.2 to 12.9. The mean KTEA score for Group B was 39.00 which indicated a mean reading level of 7.9. Finally, the range of scores for the Control group was 17 to 46 indicating reading levels from 1.9 to 12.9. The mean KTEA score for the Control group was 37.60 which indicated a mean reading level of 6.6

Table 9

<i>Descriptive Statistics for Kaufman Test of Educational Achievement</i>			
Source	KTEA mean Score	Reading Level	SD
Group A (<i>n</i> = 18)	36.22	5.50	5.44
Group B (<i>n</i> = 19)	39.00	7.90	5.89
Control (<i>n</i> = 15)	37.60	6.60	7.57

Table 10 depicts the mean Genre test scores for each group. The range of scores for the Genre test was 0 to 7. An initial estimate in the form of a pretest was administered to determine prior knowledge of the genre of detective fiction before implementing the

study. The range of scores on the Genre pretest obtained for Group A was 1 to 5. The mean for Group A was 2.11. The range of scores obtained on the Genre pretest for Group B was also 1 to 5. The mean for Group B was 2.68. Lastly, the range of scores obtained on the Genre pretest for the Control group was 1 to 4. The mean for the Control group was 2.13. After the implementation of the study, a follow up estimate of knowledge of the genre of detective fiction in the form of a posttest was administered. The range of possible scores on the posttest was 1 to 7. The range of scores on the Genre posttest obtained from Group A was 1 to 6. The mean for Group A was 3.83. The range of scores on the Genre posttest obtained from Group B was 1 to 7. The mean for Group B was 4.79. Finally, the range of scores obtained on the Genre posttest for the Control group was 2 to 6. The mean for the Control group was 4.27.

Table 10

Source	<i>Descriptive Statistics for Pretests and Posttests of Genre</i>			
	Pretest		Posttest	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Group A (<i>n</i> = 18)	2.11	1.37	3.83	1.98
Group B (<i>n</i> = 19)	2.68	1.11	4.79	1.72
Control (<i>n</i> = 15)	2.13	0.99	4.27	1.10

Table 11 depicts descriptive information about the test scores for *The Hound of the Baskervilles*. An initial estimate in the form of a pretest was administered to determine prior knowledge of the novel before implementing the study. The range of

possible scores for this test was from 1 to 10. The range of scores obtained from Group A on the pretest was 1 to 7. The mean score for Group A was 3.50. The range of scores obtained from Group B on the pretest was 1 to 8. The mean for Group B was 3.63. Finally, the range of scores obtained from the Control group on the pretest was 1 to 9. The mean for the Control group was 4.00. A follow up estimate of knowledge of the novel *The Hound of the Baskervilles* was administered in the form of a posttest. The range of possible scores was 0-10. The range of scores obtained from Group A on the posttest was 1 to 8. The mean for Group A was 4.56. The range of scores obtained from Group B was also 1 to 8. The mean for Group B was 4.32. Lastly, the range of scores obtained from the Control group was 2 to 8. The mean for the Control Group was 4.53.

Table 11

Descriptive Statistics for Pretests and Posttests of The Hound of the Baskervilles

Source	Pretest		Posttest	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Group A (<i>n</i> = 18)	3.50	1.47	4.56	2.38
Group B (<i>n</i> = 19)	3.63	1.57	4.32	1.95
Control (<i>n</i> = 15)	4.00	2.14	4.53	1.78

Table 12 depicts descriptive information about the test scores for *The Murders in the Rue Morgue*. An initial estimate in the form of a pretest was administered to determine prior knowledge of the short story *The Murders in the Rue Morgue* before implementing the study. The range of possible scores on the pretest was 0 to 10. The

range of scores obtained from Group A on the pretest was 1 to 7. The mean score for Group A was 3.50. The range of scores obtained from Group B on the pretest was 1 to 5. The mean score for Group B was 2.63. The range of scores obtained from the Control group on the pretest was 0 to 5. The mean score for the Control group was 2.00. A follow up estimate in the form of a posttest was administered at the conclusion of the study. The range of possible scores on the posttest was 0 to 10. For Group A, the range of scores obtained on the posttest was 1 to 7. The mean score for Group A was 4.22. The range of scores obtained for Group B on the posttest was also 1 to 7. The mean score for Group B was 4.26. The range of scores obtained from the Control group on the posttest was 2 to 8. The mean score for the Control group was 4.67

Table 12

Descriptive Statistics for Pretests and Posttests of The Murders in the Rue Morgue

Source	Pretest		Posttest	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Group A (<i>n</i> = 18)	2.89	1.53	4.22	1.83
Group B (<i>n</i> = 19)	2.63	1.21	4.26	1.82
Control (<i>n</i> = 15)	2.00	1.46	4.67	1.29

Research Questions

A variety of statistical tests were conducted to analyze the data gathered to address the research questions. Each question will be addressed separately.

RQ1: What are the effects of playing a commercial off-the-shelf video game upon prior knowledge of genre and background of literary selections?

To analyze the data gathered in response to this question, a repeated measures ANCOVA was conducted. The initial estimate of prior knowledge of genre (pretest scores) was compared to the follow-up estimate of knowledge of genre (posttest scores) while controlling for reading ability with the KTEA scores as a covariate. The repeated measures ANCOVA produced an $F(2, 50) = .097$, ns.

RQ2: What are the effects of playing a commercial off-the-shelf video game upon prior knowledge and reading comprehension?

To analyze the data gathered in response to this question, the initial estimate of prior knowledge of *Hound of the Baskervilles* (pretest scores) and follow-up estimate of knowledge of *Hound of the Baskervilles* (posttest scores) were compared by conducting a repeated measures ANCOVA controlling for reading ability with the KTEA scores as a covariate. The results produced an $F(1, 49) = 0.281$, ns. The initial estimate of prior knowledge of *The Murders in the Rue Morgue* (pretest scores) and the follow-up estimate of knowledge of *The Murders in the Rue Morgue* (posttest scores) were also compared by conducting a repeated measures ANCOVA while controlling for reading ability with the KTEA scores as a covariate. The results produced an $F(1, 49) = 3.821$, ns.

RQ3: Is there a difference in the reading comprehension of near and far transfer of knowledge gained from playing a commercial off-the-shelf video game in regard to the genre of a related literary selection?

To analyze the data gathered in response to this question, the mean difference scores for the initial estimate of prior knowledge of *The Hound of the Baskervilles* and the follow-up estimate of knowledge of *The Hound of the Baskervilles* were compared to the mean difference scores for the initial estimate of prior knowledge of *The Murders in the Rue Morgue* and the follow-up estimate of knowledge of *The Murders in the Rue Morgue*, that is the gains from the pretest to the posttest on *The Hound of the Baskervilles* were compared to the gains from the pretest to the posttest on *The Murders in the Rue Morgue*. A dependent *t*-test was conducted. The gains from both tests are depicted in Table 13 below. The results from the gain at time one yielded a $t(36) = -1.364$, ns.

As an alternative and to examine further, a repeated measures ANCOVA was conducted using the same mean differences scores and also controlling for reading ability with KTEA score as a covariate. The ANCOVA produced an $F(1, 35) = .135$, ns.

Table 13

Mean differences scores on The Hound of the Baskervilles and the Murders in the Rue Morgue

Source	Mean ($n = 37$)	Standard Deviation
<i>The Hound of the Baskervilles</i>	0.86	2.15
<i>The Murders in the Rue Morgue</i>	1.49	2.01

RQ4: Does the sequencing of instruction influence near and far transfer of learning for reading comprehension?

To address this question, the data were analyzed using an independent *t*-test to examine the mean differences scores from the initial estimate of prior knowledge on *The Hound of the Baskervilles* (pretest) and the follow-up estimate of knowledge on *The Hound of the Baskervilles* (posttest) for experimental Group A to the mean differences scores from the initial estimate of prior knowledge on *The Hound of the Baskervilles* (pretest) and the follow-up estimate of knowledge on *The Hound of the Baskervilles* (posttest) for experimental Group B . The analysis revealed a $t(35) = 0.520$, ns.

Likewise, a similar test was run for *The Murders in the Rue Morgue*. The data were analyzed using an independent *t*-test to examine the mean differences scores from the initial estimate of prior knowledge on *The Murders in the Rue Morgue* (pretest) and the follow-up estimate of knowledge on *The Murders in the Rue Morgue* (posttest) for experimental Group A to the mean differences scores from the initial estimate of prior knowledge on *The Murders in the Rue Morgue* (pretest) and the follow-up estimate of knowledge on *The Murders in the Rue Morgue* (posttest) for experimental Group B . The analysis revealed a $t(35) = - 0.446$, ns. Table 14 depicts the gain scores for *The Hound of the Baskervilles* and *The Murders in the Rue Morgue* for both experimental groups.

Table 14

*Mean Differences Scores on The Hound of the Baskervilles
and Murders in the Rue Morgue by Experimental Group*

Source	<i>The Hound of the Baskervilles</i>		<i>The Murders in the Rue Morgue</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Group A (<i>n</i> = 18)	1.06	2.15	1.33	1.97
Group B (<i>n</i> = 19)	0.68	2.19	1.63	2.09

CHAPTER 5

DISCUSSION

In this chapter, the results will be interpreted in relationship to the hypotheses. These are organized by the research questions. Finally, limitations and implications for practice and research are offered.

Research Question 1: What are the effects of playing a commercial-off-the-shelf video game upon prior knowledge of genre and background of related literary selections?

For Research Question 1, it was hypothesized that playing a commercial-off-the-shelf video game would help students develop prior knowledge of the genre and background for a work of literature. This background information would be provided by anchoring the information about the genre in an inquiry based learning environment (Driscoll, 2000; Gee, 2003; Van Eck & Dempsey, 2002) thereby allowing students to adapt and transform what they learned as they advanced in the game and later moved to print based narrative. Although all of the groups involved in the study showed growth in knowledge of the detective fiction genre, that is the mean for Group A increased from 2.11 to 3.83, Group B increased from 2.68 to 4.79, and the Control Group increased from 2.13 to 4.27, the statistical results failed to achieve significance.

Prior research has established that to be successful at retaining material being read, the reader must make connections with correlated long-term memory (Driscoll, 2000). Further, the meaning that a reader gleans from a text is controlled not only by the text itself, but also by the prior knowledge the reader has of the subject matter of the text (Driscoll, 2000). Perhaps the experiences gained while playing the commercial-off-the-shelf game did not make the transition into long-term memory or did not provide enough

depth of knowledge about the genre of detective fiction to meet the demands of the reading selections. Also, maybe the length of time devoted to this study was not lengthy enough for the development of prior knowledge to make the transition from short term to long-term memory.

In addition, it has been proposed that simulation games might function similarly to anchored instruction by making use of authentic situated learning (Van Eck & Dempsey, 2002). Possibly the context of the game was not similar enough to the context of reading for the participants of this study to bridge the differing environments of interactive game play to passive text. Participating inside the game environment allows the player/learner to experiment and make discoveries which in turn lead the learner to transfer what has been learned early in the game to later problems (Gee, 2003). Although the teacher did report that the students in the experimental group did make connections between the game and the reading quite easily in class discussion, this knowledge apparently did not make the transition to the assessment used for this study. Barnett and Ceci (2002) found that transfer tended to be more successful when the domain to which the learning was being transferred was already somewhat familiar to the learner. This condition does not seem to have been met.

Research question 2: What are the effects of playing a commercial off-the-shelf video game upon prior knowledge and reading comprehension?

For Research Question 2, it was hypothesized that playing a commercial-off-the-shelf game would help students develop prior knowledge and would facilitate reading comprehension of unfamiliar material by strongly encouraging participation in the action of the narrative (Gee, 2003; Shaffer et al., 2005) thereby giving students resources for

future learning. All of the groups involved in the study showed growth in this area, that is the mean for *The Hound of the Baskervilles* for Group A increased from 3.50 to 4.56, Group B increased from 3.63 to 4.32, and the Control Group increased from 4.00 to 4.53, the statistical results failed to achieve significance. Furthermore, the mean for *The Murders in the Rue Morgue* for Group A increased from 2.89 to 4.22, Group B increased from 2.63 to 4.26, and the Control Group increased from 2.00 to 4.67. However, the statistical results in all instances failed to achieve significance.

Although video games do not allow players to remain passive and instead situate learners inside the narrative while assuming a character's identity (Gee, 2003; Shaffer, et al., 2005; Squire, 2006), perhaps this type of prior experience does not translate to the more passive experience of reading a narrative in a text based format. Participation in a video game environment allows students to test their prior knowledge for accuracy by providing them with ongoing feedback in the midst of game play (Gee, 2003; Squire, 2006), but reading a text does not necessarily provide corrective feedback until assessment occurs at some time after reading.

Research Question 3: Is there a difference in the reading comprehension of near and far transfer of knowledge gained from playing a commercial off-the-shelf video game in regard to the genre of a related literary selection?

For Research question 3, it was hypothesized that playing a commercial-off-the-shelf video game would affect reading comprehension by improving background knowledge (Duke & Pearson, 2005; Gee, 2003) about detective fiction and in turn would transfer to improved reading comprehension through the mechanism of arousing mindfulness (Perkins, 1992) about detective fiction. Although all of the groups involved

in the study showed growth in near transfer (i.e., knowledge on Sherlock Holmes in *The Hound of the Baskervilles*) and far transfer (i.e., knowledge on Poe's *The Murders in the Rue Morgue*). Specifically, the mean gains score for *The Hound of the Baskervilles* was 0.86 while the mean gains score for *The Murders in the Rue Morgue* was 1.49. Neither of these results achieved statistical significance.

The contexts of many of the classic works of literature that students are required to read in school based settings are far removed from the students' personal experiences thus limiting the background knowledge that students bring with them to their reading experiences. Successful comprehension requires relevant prior knowledge (Duke & Pearson, 2005). Hands on activities such as excursions, conversations, and other experiences are necessary in order for students to build vocabulary and concept knowledge that may be required to understand a text (Duke & Pearson, 2005). Video games provide players hands-on opportunities to learn from semiotic domains in which players actively encounter the game world in new ways, gain some sense of social interaction with characters and/or other players, and gain feedback from the visual environment (Gee, 2003). So, active learning in video games appears to support learners in gaining background knowledge.

However, for transfer to occur, several conditions must be met among which are extensive practice in a variety of contexts, the ability of the learner to abstract critical attributes of the scenario or concept being studied, and meta-cognitive reflection while learning (Perkins, 1992). In fact, Squire (2004) was concerned about whether the knowledge his participants gained from playing a social studies game would transfer to the course content he hoped to impact through playing the game. In order to encourage

transfer, he built in a variety of social studies related activities including reading supplementary articles, maps, timelines, globes, and class discussions. In addition, the participants in his study explained to their peers what they learning about social studies during game play. Perhaps in this instance, because of the nature of the learners, the environment, the teacher, or the material being studied, the participants in the study were unable to meet the conditions of transfer, specifically the ability to abstract critical attributes of the genre of detective fiction as represented in the video game to their reading. Also, the definition of Perkins' *extensive practice* is vague. So, the length of the study and time for students to interact with the game may have been too limiting. Finally, as Charsky and Mims (2008) suggest, reflection through journaling may offer a continuing method for engaging students with the game and content, as well as encourage students to reflect on what they have learned. However, the participants' reading levels were startlingly low, and the students were unenthusiastic in journaling. So, they may not have benefitted from the meta-cognitive practice.

Research Question 4: Does sequencing of instruction influence near and far transfer of learning for reading comprehension?

For Research question 4, it was hypothesized that sequencing instruction would not impact the near and far transfer of learning. Because the information gained from playing the video game would be of a general form of detective fiction, it would be more likely to transfer than if the game had been specifically designed to train the students in a particular set of procedures or specific facts (Barnett & Ceci, 2002). In this study, the sequence of instruction made little difference, that is the mean differences scores for Group A on near transfer (*The Hound of the Baskervilles*) was 1.06 and for Group B was

0.68 while the mean differences scores for Group A on far transfer (*The Murders on the Rue Morgue*) was 1.33 and for Group B was 1.63. None of the comparisons of these differences were statistically significant.

According to Barnett and Ceci (2002), transfer is a complex process that involves many factors among which are memory demands. Memory demands concern whether learners are required to execute the learned activity prompted by hints or if they have to choose the correct approach unaided. Transfer usually proceeds more smoothly when cues are allowed for learners; however, cues are not given on standardized tests nor were they given on the assessment utilized for this study. Perhaps the memory demands for transfer were not met by the conditions given to the participants. Further, the success of transfer is affected by the six domains of context, which encompass knowledge, physical, temporal, functional change, social context, and modality (Barnett & Ceci, 2002). All of these domains were affected by the conditions of the study. For example, the physical context was affected by the fact that the video game was played in a computer lab in a separate building from the classroom in which all of the other activities took place. The temporal context may have been affected because the study was interrupted by the implementation of state mandated standardized testing for a period of three weeks. The functional context, the function for the skill and the mindset evoked in the individual, may have been affected because of the novelty of playing a commercial off-the-shelf video game at school and then returning to the normal routine of reading classic literature. In addition, the modality or mode of the experiences may have affected transfer because at the macro level, playing the video game was an active experience while reading the text was a passive experience. At the micro level of modality, the assignments

accompanying playing the game and reading the literature were related to writing: journaling, essay writing, and critiquing while the assessment was designed using multiple choice questions like those used in the ACT exam. Additionally, research about alignment of instructional stimuli shows that when the stimuli and the assessment are properly aligned, meaning the instructional outcomes, processes, and assessments all have matching stimulus conditions, learners perform better (Cohen, 1987). This is particularly true for lower aptitude students who seem to be more affected than higher aptitude students by instructional misalignment (Cohen, 1987).

Limitations and Implications

First, limitations for the study will be discussed. Then the implications for practice for educators will be examined along with implications for further research.

Limitations

Several limitations affected this study including the moderate sample size, the logistics of the implementation of the interventions, the wide range in ability levels of the participants, the experience level of the teacher and students with technology integration lessons, and finally the fact that just one teacher participated in the study. The sample only included 52 participants split across 3 groups. The data would have benefited greatly from a larger sample size. The logistics of the implementation were affected by the realities of the necessities of the classroom. For example, standardized testing took place during the study for a period of over 2 weeks during which normal class schedules were completely deferred. Therefore, there was no contact with the material for up to 3 weeks between the end of the implementation and the posttest. Also, the posttest was administered during the last week of the school year. These factors likely had an effect on

the results. In addition, the teacher does not normally employ technology integration strategies in the classroom, so he had to learn to manage the equipment, the content, and the students in this new context during the study.

Further, while the transfer from the video game to *The Hound of the Baskervilles* could be considered near transfer because both items are about the character and world of Sherlock Holmes, it could also be considered far transfer. The modality of playing the video game is different than that of reading text. It is difficult to define the nature of the degree of distance the material is transferred because the literature about far transfer especially is unclear (Barnett & Ceci, 2002).

Practice

The results of this study suggest that integrating video games into standard classroom practice, like all other forms of technology integration, is a complex endeavor (Bauer & Kenton, 2005; Becker & Jacobson, 2005; Hernandez-Ramos, 2005; Judson, 2006; McGrail, 2005; Staples, et al., 2005). Cohen (1987) suggests that when alignment is achieved, lower aptitude participants, like the ones included in this study, can perform better than higher aptitude students working under misaligned conditions. According to Charsky and Mims (2008), it is most likely that integrating commercial off-the-shelf games will be successful when it is not only aligned with curricular aims but also with the intellectual abilities of the students that are the focus of the instruction. This statement leads to two points of discussion when related to this particular study.

The first point is alignment with curricular aims: Many of the current studies and models of digital game-based learning using commercial off-the-shelf games are games that naturally lend themselves to social studies and/or math activities (Charsky & Mims,

2008; Squire, 2006; Van Eck & Dempsey, 2002). It is possible that some domains will more easily lend themselves to digital game-based integration efforts than others. For example, secondary language arts is a subject area that moves from one encapsulated work of literature or genre to another, while social studies considers the development of trends within a culture or across cultures over time. The differing natures of the subject matter may require domain-specific approaches (e.g., Squire, 2004; Van Eck & Dempsey, 2002) to the integration of digital game based learning, while Charsky's and Mims's model is generalized.

The second point is alignment with the intellectual abilities of the students. This particular study involved 10th grade students, 27 (50%) of whom were identified special education students. Of the 54 participants in the study, only 11 (20%) were able to read at grade level or above. Five participants (9%) read at the ninth grade level, while five participants (9%) also read at the eighth grade level. The reading levels become progressively lower with a single participant reading at a seventh grade level, and eight participants reading at the sixth grade level, six reading at the fifth grade level, nine participants reading at the fourth grade level, seven participant reading at a third grade level, and one reading at a first grade level. So, 31 of the 54 participants (57.4%) read at a sixth grade level or below while enrolled in tenth grade English.

The Hound of the Baskervilles is currently read at the eighth grade level in the school system in which this study took place, meaning that although it is usually read below the tenth grade level, it is still far above the ability level of more than half of the participants in this study. Although the instructional purposes of the game were to increase background knowledge and context, the game is not directed at improving

reading ability. It is perhaps improbable for a video game to accommodate over two grade levels of reading ability, that is from a sixth grade reading level to an eighth grade reading level. Additionally, the assessment for an instructional program of this nature needs to be carefully designed in order to accurately measure what the participants gain from the experience (Cohen, 1987).

Thus, the implications for practice gained from this study would indicate that perhaps the role of prior knowledge in improving reading comprehension is not fully understood and that the issues surrounding transfer are still in need of examination. Also, the alignment of the game, the instructional content, and the assessment of learning may be of vital importance to the success of the integration of the game. Therefore the intellectual capabilities of the students may need to be aligned with game content for maximum benefit. While digital game based learning may be more successful in some subject areas than in others, the duration of a digital game based intervention may be relevant to its degree of success.

Finally, the most significant finding of this study may be the extreme discrepancy between the participants' real abilities and the expectations for their performance by the state. The national and state mandates for these students to perform at ACT standards is going to be difficult for teachers and students to meet when students are reading at elementary grade levels in secondary classrooms. Digital game based learning may be able to provide prior knowledge that is useful for reading; however, when the needs of the readers are so great, one intervention may not be enough. Reading comprehension is not a unitary trait (Davis, 1972) and the strategies necessary to help struggling readers may require special attention. In particular, connecting reading material to prior

knowledge may a more complex process than is normally practiced in typical classrooms. In any case it is clear that the participants of this study likely could not meet the requirements that the state has set for them.

Finally, the teacher that participated in this study reported that he found the intervention to be useful when working with the participants. However, he expressed frustration when talking about the control group not having a frame of reference when discussing the literature being studied given that they had not played the game. Since he did not have the video game to serve as an anchor for his discussions with the control group, he may have inadvertently overcompensated with this group.

Future Research

Future research would benefit from larger sample sizes, a more homogenous sample, and a teacher who is more experienced with technology integration techniques. Further, it may be beneficial to contextualize the digital game based learning integration models for specific subject areas. For example, Squire (2004) studied the use of digital game based learning to provide background knowledge of historical events suggesting it could improve reading comprehension of history textbooks. Further, he expressed concern about whether students would transfer what was learned in the game to other historical contexts. He suggested a variety of supporting activities typically situated in social studies curriculum including case studies, primary source documents, and timely lectures. In fact, he did implement supporting activities including supplementary articles, maps, timelines, globes, and class discussions. In addition, the participants in his study explained to their peers what they learning about social studies during game play. He

specifically situated his model for integration within social studies. Similarly, Van Eck and Dempsey (2002) situated their digital game based model within mathematics.

Also, would it be appropriate to level games in the same manner that we level reading texts? Games often have suggested age ranges, such as “E for everyone” and “10+.” When considering these games for technology integration, it is important to match content to age in order to encourage engagement with the game. For example, secondary students are not as likely to appreciate preschool games as preschool students would be. However, when you have students who are reading at elementary levels, but have ages of 15 or 16, there may be a challenge in matching game content to learner ability. This is the same challenge that many special education programs face when trying to match age appropriate content with ability level. Some games may be too complex for learners who are having difficulty mastering the subject matter. Perhaps using differing games with the same purpose could be a method of differentiating learning for players at differing ability levels. Possibly the question of what types of information transfers to differing types of learners in specific contexts may need to be looked at further. Finally, the length of time needed for digital game based learning interventions to be effective needs to be examined.

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Appendix A
Pretest/Posttest

Appendix A
Pretest/Posttest

Hound of the Baskervilles
Pretest/Posttest

1. The point of view from which the passage is told can best be described as that of (point of view)
 - a. A friend who is upset about the strange death of his friend
 - b. A companion who helps Sherlock Holmes test his theories and ideas
 - c. An interested listener who strongly believes in supernatural events
 - d. A fan of detective Sherlock Holmes who wants to help Sherlock Holmes find a new case

2. The passage makes it clear that two hundred years earlier, Hugo Baskerville had offered his soul to the devil in exchange for (identify specific details and facts)
 - a. The capture of a girl he had kidnapped
 - b. The death of his rival for a young girl's love
 - c. Eternal life
 - d. A large fortune

3. The passage indicates that since Hugo Baskerville first called upon the hound from hell, generations of Baskervilles have (identify specific facts and details)
 - a. Ordered the hound to kill their enemies
 - b. Been killed by a terrible hound
 - c. Made their own pacts with the devil
 - d. Died violent or mysterious deaths

4. It is reasonable to conclude from information provided in the passage that Dr. Mortimer and Sir Charles were on friendly terms because of their mutual interest in (identify specific details and facts)
 - a. Baskerville Hall
 - b. Legends and magic
 - c. Science
 - d. Music

5. It can reasonably be inferred from the passage that Dr. Mortimer believes the cause of Sir Charles's death to be (inference)
 - a. Sir Charles was murdered by his butler, Barrymore
 - b. Sir Charles was the victim of the curse of the Hound of the Baskervilles
 - c. Sir Charles died of natural causes but the neighbors believe it was the Hound of the Baskervilles
 - d. Sir Charles had a heart attack while exercising
6. Dr. Mortimer describes himself as a man of science – practical and unimaginative. His attitude towards the strange events at Baskerville Hall, however, suggest that Dr. Mortimer is also (character)
 - a. Devious and cunning
 - b. Selfish
 - c. Superstitious
 - d. Meddlesome
7. The passage makes it clear that Dr. Mortimer has brought Sir Charles's death to Sherlock Holmes's attention because he (identify specific facts and details)
 - a. Questions the identity of the arriving heir to the Baskerville fortune
 - b. Fears for the personal safety of the new heir
 - c. Is convinced that Sir Charles was murdered
 - d. Believes that Sherlock Holmes is the only man who can take on the devil himself
8. Details of the passage suggest that Sherlock Holmes does not believe the curse killed Sir Charles because (cause and effect)
 - a. The evidence points to the conclusion that Sir Charles was waiting to meet someone outside and then ran for help in a direction he was normally afraid to travel suggesting someone deliberately set him up
 - b. The cigar ash found on the ground near the body shows that Sir Charles's unhealthy habits led to his heart attack
 - c. The butler, Barrymore, lied about evidence found around Sir Charles's body indicating that Barrymore actually killed Sir Charles
 - d. Sherlock Holmes thinks that Dr. Mortimer is lying about the hound's footprints found near the body of Sir Charles and that Dr. Mortimer is trying to cover up his own involvement in the murder
9. It is clear from the passage that Sherlock Holmes is the kind of man who has great respect for (character)
 - a. Reason and logic
 - b. Physical strength
 - c. Neatness
 - d. Wealth and family connections

10. Details of the passage suggest that the community's main interest in the welfare of the heir to the Baskerville fortune is because of (cause and effect)
- The fear of the spread of the curse among the community
 - The money the Baskerville family shares with the community through charity
 - The popularity of the Baskerville family
 - Concern about wild dogs running loose in the country side attacking other resident

Murders in the Rue Morgue
Pretest/Posttest

- The point of view from which the passage is told can best be described as that of: (point of view)
 - an admiring relative of a man whose unwillingness to allow an innocent man to go to jail makes him widely respected by the Parisian police
 - a man looking back on the best years of his life as the friend of a poor book collector
 - a narrator describing his experiences as they happen, starting with meeting a poor book collector and continuing through a bizarre murder investigation carried on by this book collector.
 - an unidentified narrator describing a man who devoted his life to investigating crimes the Parisian police were unable to solve
- It can reasonably be inferred from the passage that which of the following describes Dupin's relationship with the Paris Police? (inference)
 - Dupin is often consulted on difficult cases by the Parisian Police
 - He is best friends with the Chief of the Parisian Police
 - The Parisian Police do not like being shown up by Dupin and are embarrassed that he solved the case before they did
 - The Parisian Police have warned Dupin not to become involved in their police business because he does not work for them
- According to the passage Dupin and the narrator were on friendly terms because of their mutual interest in: (specific facts and details)
 - Books
 - Crime
 - Meeting new people
 - Old houses

4. The passage makes it clear that Dupin becomes interested in the Murders in the Rue Morgue because of: (specific facts and details)
 - a. His presence at the crime scene at the time of the investigation by the police
 - b. Local gossip at book stores
 - c. A request from the victim's family to help with the investigation
 - d. Stories about the murder in the Paris newspaper

5. Details of the passage suggest that Dupin does not believe that the Parisian police have identified the man who really killed the two women because: (cause and effect)
 - a. Dupin already knows who killed the women because he has been chasing this particular criminal for years
 - b. An examination of the crime scene shows that the timeline of the murder matches the suspects alibi
 - c. The older woman is clutching nonhuman hair in her fingers
 - d. The police have made several mistakes in recent arrests

6. It is clear from the passage that Dupin is the kind of man who has little respect for (character)
 - a. The intelligence of the police
 - b. The investigative methods of the police
 - c. The police as a group
 - d. The writing of the newspaper

7. Details of the passage suggest that Dupin takes up the investigation because: (cause and effect)
 - a. He cannot stay away when he believes an innocent man may suffer
 - b. He finds the details of the crime irresistible
 - c. He likes to make the police look foolish
 - d. He owes the suspect, Le Bon a favor

8. It is reasonable to conclude from information provided in the passage that one factor that made the investigation difficult for the police: (specific facts and details)
 - a. The extreme passage of time between the crime and the time the police were notified about it
 - b. None of the witnesses spoke French
 - c. There were few clues at the crime scene
 - d. The witnesses were unable to identify the accent of one of the two criminals who could be heard committing the murder

9. According to the passage, which of the following statements accurately describes the attitude of the sailor towards the murder? (character)
 - a. Angry with Dupin for figuring out his role in the murder
 - b. Concerned that the police will kill his accomplice in the murder
 - c. Deeply regretful but unwilling to confess to his part in it until Dupin confronts him with the facts
 - d. Frightened that if he tells what he knows, he will become the next victim

10. From the last paragraph it is reasonable to infer that Dupin: (inference)
 - a. Enjoys the admiration of the Paris police
 - b. Feels that he, Dupin, should be the Prefect of Police
 - c. Hates the attitude of the Prefect of Police towards Dupin
 - d. Thinks he is superior in intellect to the Prefect of Police

Detective Fiction

Pretest/Posttest

1. Based upon playing the game and/or reading the two detective fiction selections, it is reasonable to conclude that detectives in detective fiction must
 - a. Be unusual or memorable
 - b. Behave Just like everyone else
 - c. Have a strong interest in crime
 - d. Look for clues

2. From experience playing the game and/or reading the two detective fiction selections it is clear that crimes in detective fiction must be:
 - a. Committed by men
 - b. Confusing for readers to solve because of false clues
 - c. Hard for the police to solve
 - d. Significant, such as a murder

3. It is clear from reading the detective stories and/or playing the video game that the criminal in detective fiction must be:
 - a. A man
 - b. Someone who is greedy
 - c. Someone who wants revenge on the victim
 - d. A worthy opponent for the detective

4. It is reasonable to conclude from playing the game and/or reading the detective stories that the suspects, including the guilty person must be:
 - a. Have a hidden identity
 - b. A person with a good alibi
 - c. Presented early in the story
 - d. Usually difficult for readers to identify until the end of the story

5. From experience playing the game and/or reading the two selections, all clues discovered by the detective must:
 - a. Be hard for the police to find without the detective's help
 - b. Be hidden from other characters in the story
 - c. Be known to the reader too so the reader has a chance to solve the mystery
 - d. Trick the reader into suspecting the wrong character in the story

6. Based on your experience playing the game and/or reading the detective stories, what word best describes the hero of a detective story?
 - a. Daring
 - b. Intelligent
 - c. Strong
 - d. Superior

7. Based on your experience reading detective stories and/or playing the detective game it is reasonable to expect the story to be told by:
 - a. The hero of the story
 - b. The hero's sidekick
 - c. An outsider to the story
 - d. The villain