

A CRITICAL EXAMINATION OF THE EFFECTS OF COLORED PAPER ON  
THE ACADEMIC ACHIEVEMENT OF FOURTH GRADERS IN  
READING COMPREHENSION AND VOCABULARY

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READING COMPREHENSION AND VOCABULARY

Mauna Sue Duggan

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## VITA

Mauna Sue Duggan received her M.S. in Education at Troy University, 2000. She worked in a title one elementary school and had the opportunity to teach all types of children including those with autism. She was selected “teacher of the year” at her school during the 2001-2002 school year. In the summer of 2001, she traveled to Spain for a three week mini-study at the University of Burgos. Her knowledge of Spanish allowed her to teach children and adults a second language to members of Troup County Georgia schools, as well as being a regular education teacher. She taught English as a second language to adults in the evenings at a local mill and as a volunteer through the adult literacy program in LaGrange, Georgia. This lead to starting a Spanish Club in LaGrange, with monthly meetings held at the local library. She began taking classes for her specialist degree at Auburn University and worked toward her Doctorate in Adult Education to better help members of her community. Besides being a Doctoral student she went through the LaGrange-Troup County Chamber of Commerce year long Leadership Troup program in 2004. As well as teaching full-time, research and writing have been her focus. Her current responsibilities include developing and enriching curriculum, facilitating science and social studies classes, and implementation of Promethean board technology within classes.

DISSERTATION ABSTRACT

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READING COMPREHENSION AND VOCABULARY

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Reading is a learned skill needed for life. It requires cognitive processing increasing with practice. This study examined the use of colored paper for comprehension and vocabulary assessments given to fifty-one fourth graders for the purpose of increasing test scores. All fourth grade students received weekly comprehension and vocabulary assessments on either goldenrod, Astrobright blue, green, or white paper for a period of one month. Scores were compared weekly on each color and results showed there was no color effect for either comprehension or vocabulary.

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## CHAPTER I

### INTRODUCTION

The ability to read provides academic success as well as success throughout life (Irlen, 1991). A skillful reader will sustain two major reading characteristics. One is the speed and ease at which they read the text. The other is the understanding and internalizing of the text being read (Jager-Adams, 1994). Ouellette (2006) states “reading does not only involve decoding and visual word recognition: The end goal is comprehension” (p. 556). Many factors influence a person’s ability to read the text and comprehend what they are reading: internal and external stimuli, phonological processing, and visual processing. Black print on a white background may not provide the ultimate reading experience for all readers. Finding alternative strategies to increase reading fluency and comprehension have been a challenge to students, parents, and teachers.

Reading requires the use of internal and external stimuli. All five senses explore the world around us, but color is a direct response to the sense of sight (Evans, 1974). Over the years, the use of color for visually enhancing a person’s reading ability has undergone a transformation from the use of colored chalk on chalkboards to using black ink on colored paper. Using colored paper for the background of a text may enhance the eye’s ability to focus and adhere to the print at hand. The ability of the eyes to perceive color and color hues vary from person to person and are individually specific with regard

to optimal color interpretation (Evans, 1974). There are literally hundreds of color combinations and light intensities that can affect the way we view our world (Irlen, 1991). Some colors are more soothing than others and some actually have a negative effect. According to Irlen (1991) some people have trouble reading with high contrasts such as black print on a white background. The white can overpower the black print making the text difficult to read. The brightness of the background interferes with distinguishing the letters within the words on the page, thus affecting fluency in reading the text. Within the use of colored paper, certain colors work better than others. “Beige, yellow, goldenrod, pink, blue, and green have been effective in reducing distortions and increasing contrast and readability for those with SSS [*sic* Scotopic Sensitivity Syndrome]” (Irlen, 1991, p. 177).

Scotopic Sensitivity Syndrome (SSS) is a visual perception problem “dealing with the spectral modification of light” (Irlen, 1991, p. 29). Irlen (1991) indicates SSS as an internal perception problem which not only interferes with reading letters and words, but possibly may affect motor skills, depth perception, handwriting abilities, and may lead to a negative self-concept due to the inability or possible impeding of driving skills, sports abilities, musical talents, and reading in general. The physical environment also affects learning. Fluorescent lighting may have an effect on how the print appears on the page.

Irlen (1991) asserted fluorescent lighting increases the intensity and the onset of distortions from reading black print on white paper. Grangaard (1995) ascertained a drop in blood pressure and off task behaviors of children with the use of blue colored walls and full-spectrum Duro-test Vita-lite lighting, hence increasing on-task behavior and attentiveness to duties at hand. Whatever the stimulus, whether internal or external

related, color influences the senses and may be a direct cause and effect for enhancing the ability to focus and comprehend what is going on with and around us.

Learning to read involves many cognitive skills (McDougall & Hulme, 1994). Phonological processing is an important cognitive skill that allows a reader to be successful in reading. Phonological awareness involves a phoneme/grapheme connection and is the sound/symbol relationship between letters (Eden, Stein, Wood, & Wood, 1995). Skilled readers seem to read whole words faster than reading the individual letters, but reading the individual letters using phonological awareness is actually what a good reader does (Jager-Adams, 1994). Reading requires the reader to process every letter of every word as they translate the letters into words on the page. Once the letters have been mastered and are automatic, then the words become mastered and automatic. This leads to the automaticity of phrases and sentences. Good readers exhibit phonological awareness and poor readers show deficits in this area. The old adage, practice makes perfect, doesn't always apply when readers are struggling to read the letters within the words on a page.

Stothard (1994) indicates children who have problems with decoding words have problems comprehending what was read due to the excessive effort devoted to word recognition. We are not born with phonological awareness, but acquire it through oral and visual practice (Fitzpatrick, 1997). Phonological processing does play a part in the ability of the reader to comprehend, but word knowledge, interest, and context clues allow poor readers to compensate for their lack of phonological coding abilities (Fink, 1998).

Visual processing allows the reader to focus and comprehend what is being seen. Visual discomfort such as tired or sore eyes, eye strain, and distortions of print may cause problems with reading (Conlon, 2000). Within the visual pathways of the eye there are two systems: magnocellular and parvocellular. Skottun and Parke (1999) indicated that magnocellular or transient system is made up of large cells and is a fast track that processes instant visual changes within an individual's surroundings. The parvocellular or sustained system is made up of small cells and is a slower track maintaining stagnant visual details (Singleton & Trotter, 2005). The parvocellular system is responsible for the visual attention to individual letters (Conlon, 2000). Both systems work together to process normal visual perception. The problem with visual perception comes when there is a breakdown in either system, transient or sustained. Conlon (2000) states high visual discomfort may stem from a breakdown in both systems.

Students who comprehend ineffectively have the inability to process information being read and derive meaning from the material (Stothard, 1994). The ability to comprehend what is being read may be affected when there is a breakdown of a cognitive function, whether brain, eyes, light, or color related.

#### Problem Statement

Research is lacking to ascertain if using color as a background reduces distractions and allows the reader to focus more on the printed words. If learners increase their focus more on processing print, take less effort in reading the words on the page, and develop reading fluency, then an increase in comprehension may follow. Specifically, there is a lack of research on the use of black text on colored background

and whether or not it increases reading comprehension, vocabulary acquisition, and fluency.

### Purpose of Study

The purpose of this study was to determine if using black text on colored background would increase reading comprehension and vocabulary scores as compared to the use of black text on white background.

### Research Questions

1. What, if any, are the differences in scores between students who took their reading tests on goldenrod, Astrobright blue, or green colored paper as compared to tests taken on white paper?
2. What, if any, are the differences between the reading scores of regular education students, gifted students, students with academic difficulty, special education students and students with speech difficulties who took their tests on colored paper as compared to tests on white paper?

### Significance of Study

This study was conducted to determine the extent to which the use of colored paper as a background for black text increased the fluency of reading the print, thus leading to an increase in reading comprehension. The use of colored paper on standardized reading tests may assist students across various grade levels. This study could further enhance school districts' new teacher training and professional development programs. Indications are that the use of color paper, whether for reading or writing, influences reading fluency and comprehension.

### Assumptions of Study

Several assumptions were made prior to the study. One of these assumptions was that a wide range of students including gifted and talented, average students, students with disabilities and slow learners would profit from using colored paper as the background for the text on reading comprehension and vocabulary tests. Another assumption was if scores improved using colored paper for the text on reading comprehension tests, colored paper could be used for all materials in all subject areas that require reading of text for the purpose of increasing reading fluency and comprehension of the material being learned.

### Limitations of Study

There were several limitations to this study. The first limitation was the number of students in the study. In this study, 51 fourth grade students received all colors of paper. Therefore, caution should be used to generalize these results to a larger population. Another limitation to the study was even though both classes received the same reading comprehension tests, other fourth grade students in other schools may not receive the exact same tests. These results may not be indicative of all fourth grade students in all schools. A third limitation was the use of only fourth grade students. Students of all ages and grades were not assessed and therefore may or may not benefit from using colored paper as a background for printed text materials. The fourth and final limitation was the population of the students within this school and study included low socio-economic family backgrounds, majority free and reduced lunch participants, and the majority of students were minority children. This school may not be indicative of all school populations.



## Definitions of Terms

The following terms are defined for clarification and interpretation of their use in this study:

1. Chapter book – a book written for older students long enough to be divided into chapters but not long or complex enough to be considered a novel.
2. Cloze - a test of reading comprehension in which blank spaces in a text must be filled in with appropriate words.
3. Comprehension - The ability to understand and attain meaning from what has been read.
4. Criterion Referenced Competency Test (CRCT) - Contains test sections of reading comprehension and vocabulary, language arts, math, science, and social studies. It is used to assess students' knowledge of what has been taught during the school year.
5. Fluency - The ability to read quickly and accurately. This includes the reader's ability to recognize words automatically, group words together as in chunking, make few reading errors, and the reading sounds natural, as in speech.
6. Gifted Students – To be gifted a student must qualify in three of the four following areas: Mental ability at the 96<sup>th</sup> percentile, Creativity at the 90<sup>th</sup> percentile using the Torrance assessment, Motivation at the 90<sup>th</sup> percentile, and Achievement at the 90<sup>th</sup> percentile based on the total reading, math or composite on the Iowa Test of Basic Skills (ITBS).

7. Lexia Comprehensive Reading Test (Lexia CRT) - A reading ability test which measures phonics ability, sight word recognition, grapheme/phoneme relationships and reading comprehension. Within the reading comprehension piece other weaknesses or strengths appear such as details, inferencing, sequencing, cause and effect, main idea, and vocabulary knowledge.
8. Grapheme - The printed letter itself. It represents the smallest unit of written language that represents a sound in a spoken word. There can be one letter graphemes: p, t, k, a, n, or multiple letter phonemes: ch, sh, th, ea, igh, or ck, those of which symbolize one phoneme.
9. Morpheme - The smallest meaningful unit or form in a language. It may include affixes or base words.
10. Onset - The initial sound of a word.
11. Phoneme - The sound a letter makes. It is the smallest unit that represents a sound in spoken language. There are approximately 41 phonemes in the English language. Syllables and words are made of combined phonemes.
12. Phonemic Awareness - The ability to manipulate phonemes by noticing, thinking about, and working with individual sounds in spoken words. Phonemic awareness is a subcategory of phonological awareness.
13. Phonological Awareness - The ability to make connections between graphemes (print) and phonemes (sound). This is a broad category including recognizing and manipulating substantial parts of the spoken language such as syllables, words, onsets and rimes, as well as

phonemes. It incorporates other aspects of sound, such as alliteration, rhyming, and intonation.

13. Picture book – A book in which the illustrations are as important as the text in the telling of a story primarily for young children.
14. Regular Education Student – Any student who does not qualify for special services such as gifted or learning disabled as identified through testing.
15. Rime - The middle and ending sounds in words.
16. Scotopic Sensitivity Syndrome (SSS) - A visual perceptual dysfunction known to include all or some of the following five factors: sensitivity to light, inadequate background adaptation, inadequate print resolution, restricted recognition of print, and lack of sustaining focus and attention.
17. Student Support Team (SST) - A team of adults consisting of an administrator, a chairperson, a school psychologist, and teachers from different grade levels who meet periodically to offer suggestions and alternative strategies for student learning. The student's progress is reviewed at least every eight to twelve weeks and is monitored at four weeks. Interventions may be changed if they are not working. Probes are administered according to the child's learning difficulty. Graphs are completed to check for progress or no progress. This team also makes recommendations for specific types of testing.
18. Verbal Intelligence - The ability to analyze information and solve problems using language-based reasoning.

19. Vocabulary - The name for words we must know in order to listen, speak, read, and write. Two ways to learn vocabulary are: indirectly (hearing and seeing words as we listen, talk, and read) and directly (someone teaching words and definitions).
20. Wechsler Intelligence Scale for Children (WISC-R) - was developed by David Wechsler and is a revised intelligence test for children between the ages of 6 and 16 for the purpose of generating an IQ (intelligence) score that can be completed without reading or writing.

#### Organization of Study

Chapter I introduces the study, the problem, its purpose, research questions, significance, assumptions, limitations, and definitions of terms. Chapter II includes a literature review that researches predictors of reading achievement such as vocabulary development, parental involvement and education of, environment, print exposure, behavior, phonological awareness, intelligence, visual acuity, and light sensitivity. This chapter concludes with the use of color as a strategy to increase reading fluency and comprehension. Chapter III consists of the procedures, data collection and results, and data analysis. Chapter IV contains the findings of this study. The summary, conclusions, implications, and recommendations for further research are included in Chapter V.

## CHAPTER II

### LITERATURE REVIEW

#### Introduction

Jacobson and Lundberg (2000) state “the process of reading acquisition is certainly a complex human function depending on a very large a number of factors” (p. 293). Several factors are powerful predictors of early reading achievement. These factors include but are not limited to parental involvement and print exposure, vocabulary development, phonemic awareness, phonological awareness, fluency, intelligence, behavior, visual acuity, and light sensitivity. Some children are hindered in reading development by some innate obstacles or deficits and some are slow starters and catch up as they mature (Jacobson & Lundberg, 2000). Moats (2001) stated 25 percent of our nation’s adults are functionally illiterate.

Poor readers as adults do not like to read, struggle with comprehension, have a limited vocabulary, are unfamiliar with sentence structure, and may have other language weaknesses (Moats, 2001). Grangaard (1993) stated, “Farmers and biologists have manipulated the environments of plants and animals for years in attempts to create bigger, healthier products for the market” (p. 2). Yet, little has been done with regard to improving the capability and production of a more fluent, comprehending reader. Strategies are available to increase a person’s ability to read and comprehend, one of which is the use of color.

The International Reading Association (2000) stated:

No single method or single combination of methods can successfully teach children to read. Instead, each child must be helped to develop the skills and understanding he or she needs to become a reader. These include the following:

- a motivation to read,
- appropriate active strategies to construct meaning from text,
- sufficient background information and vocabulary to foster reading comprehension,
- the ability to decode unfamiliar words,
- the ability to read fluently, and
- an understanding of how speech sounds (phonemes) are connected to print.

Because children learn differently, teachers must be familiar with a wide range of proven methods for helping children gain these skills. (p. 3)

### Parental Involvement

Parental involvement is important in the development of a child's reading ability both before school age and during the formative school years. Reading immersion from infancy on, exploring outdoor environments, and playing games with children allows for easy recognition of the printed word (Hafner, 1991). Hafner (1991) stated the parent's role should include providing "suitable experiences needed for their children to develop vocabulary and prior information" (p.16). Children learn socialization skills and begin to develop their schema from being at home with their families, developing a foundation for reading success. Hart & Risley (2003) found child and parent similarities. "We observed the 42 children grow more like their parents in stature and activity levels, in vocabulary resources, and in language and interaction styles" (Hart & Risley, 2003, p. 112). By the time these 42 children were three years old, patterns were already established in vocabulary growth, similarities in style of interaction of others, and trends in amount of talk between the parents and their children were already identifiable. Hart and Risley (2003) also stated in this study, as they listened to the children, they seemed to hear the

parents talking. “By the age of 34-36 months, the children were also talking and using numbers of different words very similar to the averages of their parents” (Hart & Risley, 2003, p. 112).

In a five year longitudinal study performed by Sénéchal and LeFevre (2002) parental reading of storybooks during preschool years enhanced vocabulary and listening comprehension and over time increased reading fluency. This study revealed three objectives; the importance of storybook reading and parent’s reports of teaching to the child’s development of literacy, the relationship of early literacy exposure to reading acquisition, and the relationship of early literature exposure to fluency development. Parental involvement in early literacy skills allows for successful acquisition of mechanics of reading and reading success as well as developing fluency throughout the formative years (Sénéchal & LeFevre, 2002).

Reading with a child as they grow and mature allows for the development of both listening and reading comprehension. Reading comprehension correlates closely with listening comprehension. Whatever strategies used for increasing listening comprehension will also increase reading comprehension and this is reciprocated (Hafner, 1991). Hawes and Plourde (2005) found a slight positive correlation between the amount of parental involvement and their sixth grade child’s reading comprehension level. “Direct parental involvement in a child’s learning affects that learning in positive ways” (Hawes & Plourde, 2005, p. 55).

A study by Hart and Risley (1992) showed the amount and quality of parenting per hour in a child’s life affects that child’s language development in a negative or positive way. This longitudinal two and half year study addressed two issues. The first

issue was which different aspects of parenting were important to child development and the second issue was how important were these individual and combined parental aspects to the individual child developmental differences. The aspects that were addressed were: if the child was in the presence of an adult during their play time, if the parent joined in the child's activity, the responses to child interactions, the prohibitions stated from parent to child, the number of morphemes between the parent's utterance length and the child's utterance, the number of parental wording, repetitive parental utterances of the child utterances, number of parental question asking utterances, the amount of parental talk to the child, and the average number of parental turns relating to the action of the child and the parental response to that action. This study proved the more time a parent spends talking, questioning, repeating, and elaborating, the more developed a child's vocabulary and language acquisition. The more time a parent spends on prohibiting a child's actions and using negative words, the less a child will interact and acquire language skills and more likely develop a language deficit.

Text reading increases new knowledge (Fielding & Pearson, 1994). Vocabulary, general information, word recognition and decoding, and listening comprehension affect achievement not only in reading but also in the content areas such as mathematics, science, social studies, and language arts (Hafner, 1991). The national No Child Left Behind Act of 2001 (U.S. Department of Education, 2001) includes a guide to reading tips for parents and states parents should read to their baby every day starting at six months of age. This document states a teacher cannot make up the loss of literate mental ability if a child has not been read to before the age of five. The reading aloud of higher leveled books to primary aged children allows for an increase of vocabulary words not



normally acquired within their independent reading level (Beck & McKeown, 2007). They stated learning words does not occur easily. It takes time and practice to comprehend unknown words. A longitudinal ten year study by Cunningham and Stanovich (1997) showed exposure to print as a significant predictor of a variety of verbal abilities in a child. Higher declarative knowledge and verbal abilities were found ten years later in those children who showed early success in reading acquisition. “Individual differences in exposure to print can predict differences in the growth in reading comprehension ability throughout the elementary grades and thereafter” (Cunningham & Stanovich, 1997, p. 942).

Hart and Risley (2003) found that what parents did with regard to vocabulary growth with their children before the age of three was strongly associated with language skills and reading comprehension scores by the age of nine-ten. The amount and quality of parental involvement may make a difference in a child’s early reading development.

A powerful parental impact can be made on a child’s literacy by reading aloud, providing print materials, and promoting positive reading and writing attitudes (U.S. Department of Education, 2001). An early start in reading and print exposure has a lasting effect on literacy development.

### Vocabulary Development

According to Lehr, Osborn, and Hiebert (2004) in order for students to comprehend what they read, they need to have an extensive vocabulary and be able to utilize a myriad number of strategies in determining new meanings of words. The ability to achieve comprehension begins with the acquisition and understanding of vocabulary words (Hafner, 1991; National Institute of Child Health and Human Development,

2000b). This vocabulary knowledge begins when a child is young and in the home environment. The number of books at home is an indicator of the amount of print exposure and signifies print importance, building on vocabulary knowledge. Children will memorize and recognize words from books and favorite restaurants and this is the beginning of emergent literacy (Hoover & Lane, 1997). Biemiller (2003) indicated vocabulary development is largely determined by parental influences and practices, especially before third grade. After third grade it is difficult to bridge the gap between the have and have nots with regard to vocabulary knowledge.

In a study by Hart and Risley (2003) “86 percent to 98 percent of the words recorded in each child’s vocabulary consisted of words also recorded in their parents’ vocabularies” (p. 112). Also stated within this six year longitudinal study was a comparison between the vocabulary usage of families on welfare and those of professionals. “The three year children from families on welfare not only had smaller vocabularies than did children of the same age in professional families, but they were also adding words more slowly” (Hart & Risley, 2003, p. 114).

A child’s vocabulary will increase as they interact with others, whether at home or in school. Crain (2005) stated increasing a child’s vocabulary can raise their academic achievement. Allington (2002) accentuated school textbooks include vocabulary higher than the child’s current grade level. Prior vocabulary knowledge is needed for the brain to be able to access the meanings of words as they are read in the sentence and the more prior vocabulary knowledge a person possesses, the more likely that person will recognize and produce alternative inference words (Calvo, 2004). According to Ouellette (2006) “vocabulary growth thus encompasses adding and refining phonological

representations to the lexicon as well as storing and elaborating the associated semantic knowledge” (p. 555). The lack of vocabulary knowledge restricts the use and understanding of alternative inference words, causing the reader to be slower in comprehending and predicting text.

In a study by Calvo (2004) he found those with limited vocabularies needed more time to look back and reread, think about alternative words, and generate inferences. According to the National Institute of Child Health and Human Development (2000a) we can never exactly know how much vocabulary a person has acquired. But we can determine the extent of a person’s vocabulary by the amount of unfamiliar words they can identify. People with large vocabularies are able to identify more unfamiliar words.

Oral vocabulary plays an important part in learning to read (National Institute of Child Health and Human Development, 2000b). “A better understanding of the relations between oral vocabulary and reading skills has direct relevance to theories of literacy acquisition as well as applied significance in explaining individual differences and in guiding instructional approaches to literacy teaching and stimulation” (Ouellette, 2006, p. 554). As a reader comes across unfamiliar text, the written text is transformed into speech, with the understanding that speech will bring sense to the written word. If the written word, transformed into the oral word, isn’t in the reader’s vocabulary, then comprehension of the text is lost. Ouellette (2006) determined “oral vocabulary is related to word recognition through phonology and semantic representation and is further related to reading comprehension through depth of semantic knowledge” (p. 563).

Vocabulary disparities are seen within socio-economic groups. Hart and Risley (2003) state the size of a child’s vocabulary can be increased, but not the developmental

trajectory or rate of vocabulary acquisition. In a longitudinal study performed by Hart and Risley (2003) there was vast vocabulary growth in high socio-economic families, but the vocabulary growth of low socio-economic families was extremely slower. Many low socio-economic students lack the vocabulary development needed to understand advanced textbooks (Hart & Risley, 2003).

Slocumb (2004) indicates that children in poverty, boys in particular, are typically lacking in language development. They “aren’t exposed to language in the same way as middle-class boys” (Slocumb, 2004, p. 26). A study performed by Hart and Risley (1992) showed the children of lower socio-economic families received considerably less talk and language effort time from parents than children of higher socio-economic families. Oral vocabulary used by the parent interacting with the child was recorded. Negative connotations of words to prohibit their children’s activities were used more in lower socio-economic households. Thinking questions and less discouraging words were used, words were repeated, and elaborations on the part of the parent were seen within higher socio-economic households. Slocumb (2004) avowed “reading requires analytical decoding” (p. 108), yet in today’s society lower socio-economic children get most of their language exposure from watching television. We have become a visual world versus a linguistic world and this affects our children in a negative way (Slocumb, 2004). “In terms of vocabulary development, good readers read more, become better readers, and learn more words; poor readers read less, become poorer readers, and learn fewer words” (Lehr, Osborn, & Hiebert, 2004, p. 2). This is known in literacy development as the Mathew Effect, a rich get richer and poor get poorer phenomenon. When students are young they are learning to read. But for those students who have difficulty learning to

read, their reading difficulty creates difficulty when they need to read to learn. These students fall further and further behind their peers, creating a gap in which the poor readers get poorer and the rich readers become richer with knowledge.

Hafner (1991) stated of the WISC-R tests, “vocabulary correlates the highest with total intelligence” (p. 11). Increasing one’s vocabulary should not end in childhood. According to Moats (2001) no matter their chronological age poor readers must overcome expansive vocabulary deficits in order to be successful readers. Using their vocabulary and being able to decode and figure out words at an appropriate rate is an indicator of a person’s ability to comprehend text.

#### Phonemic Awareness

Before children learn to read, they need to become aware of how the sounds in words work. This is called phonemic awareness. Phonemic awareness “is critical to beginning reading development” (Fitzpatrick, 1997, p. 15). Phonemic awareness is an important component of reading and weaknesses within this component impede reading success (Smith, 1998). The National Reading Panel states “phonemic awareness and letter knowledge as the two best school-entry predictors of how well children will learn to read during their first 2 years in school” (National Institute of Child Health and Human Development, 2000a, p. 2-1). “Children who have phonemic awareness skills are likely to have an easier time learning to read and spell than children who have few or none of these skills” (Armbruster, Lehr, & Osborn, 2001).

Since the structure of the English language is alphabetic, teaching phonemic awareness allows children to make sound connections between letters (Fitzpatrick, 1997; National Institute of Child Health and Human Development, 2000a). Results showed the

teaching of phonemic awareness significantly improved reading as compared to children without any phonemic awareness instruction (National Institute of Child Health and Human Development, 2000a).

Phonemic awareness has a narrow focus and “is the understanding that the sounds of *spoken* language work together to make words” (Armbruster, Lehr, & Osborn, 2001, p. 4). Phonemic awareness focuses on the order of individual sounds of letters in words. It is the capability of breaking down words into individual sounds by detecting, segmenting, and blending and the ability to manipulate sound positions within words (Fitzpatrick, 1997; Hoover & Lane, 1997). We are not born with the ability to manipulate sounds, it is a learned skill.

Fitzpatrick (1997) and National Institute of Child Health and Human Development (2000a) confirmed there are different levels of phonemic awareness. To begin with, auditory discrimination includes the ear for language. Level one includes identifying and matching similar word patterns and listening for syllables within words. Level two allows for the sounds in words being identified through onset and rimes, blending the sounds to make words. Level three, phoneme isolation, allows for the recognition of beginning middle and ending sounds in words. It is the beginning of sound recognition in words. Level four, phoneme identity, allows for the recognition of the same sound in different words. Dividing words into separate phonemes or sounds constitutes phonemic component segmentation. Level five, phoneme deletion, is the recognition of what remains of a word when a specific phoneme is removed. Phonemic awareness includes the manipulation of phonemes to delete, substitute, change, add, or exchange sounds to make other words by using phonemic transference, the highest level

of phonemic awareness. “Being able to distinguish the separate phonemes in pronunciations of words so that they can be matched to graphemes is difficult...phonemes are folded into each other and are coarticulated. Discovering phonemic units requires instruction to learn how the system works” (National Institute of Child Health and Human Development, 2000a, p. 2-2).

The National Institute of Child Health and Human Development (2000a) states “teaching children to manipulate the sounds in language helps them learn to read” (p. 2-5). In a study by Foorman, Francis, Fletcher, Schatschneider, and Mehta (1998) explicit instruction in phonemic awareness propelled children in word reading development. This study showed culturally and linguistically diverse children, some lacking in reading ability and in many areas, accelerated their learning by direct instruction in phonemic awareness. Armbruster, Lehr, and Osborn (2001) ascertain children need phonemic awareness in order to benefit from phonics instruction and “children who cannot hear and work with the phonemes of spoken words will have a difficult time learning how to relate these phonemes to the graphemes when they see them in written words” (p. 4). Also in that study, phonemic awareness training helped to teach normal children how to spell and this continued on through their formative years. “The explanation for this may be that children who have phonemic awareness understand that sounds and letters are related in a predictable way. Thus, they are able to relate the sounds to letters as they spell words” (National Institute of Child Health and Human Development, 2000b, p. 8).

The benefits of teaching phonemic awareness far outweigh the void of not having this type of targeted instruction. But the National Institute of Child Health and Human Development (2000b) states phonemic awareness alone should not constitute a complete

reading program. It is only “one necessary instructional component within a complete and integrated reading program” (p. 1).

### Phonological Awareness

There is a strong correlation between phonological awareness and learning to read. Phonological awareness is a great predictor used for word identification and can indicate a good or poor reader (Hammill, Mather, & Roberts, 2002). Phonological awareness includes the ability to make connections between graphemes (print) and phonemes (sound).

The focus of phonological awareness is broad and according to Armbruster, Lehr, and Osborn (2001) “it includes identifying and manipulating larger parts of spoken language, such as words, syllables, and onsets and rimes--as well as phonemes. It also encompasses awareness of other aspects of sound, such as rhyming, alliteration, and intonation” (p. 4). Hammill, Mather, and Roberts (2002) describe phonological processing to include sound deletion, sound blending, and rhyming sequences. Automaticity of letters and words makes it easier for children to require less processing time (Eden, Stein, Wood, & Wood, 1995). Young children sound out letters or pronounce each letter while pronouncing a word. Older children and adults use prior knowledge of letter sound relationships and orthographic patterns for rapid recognition of words (Jacobson & Lundberg, 2000).

A study by Eden, Stein, Wood and Wood (1995) stated phonological awareness as a great predictor of reading ability. They showed a significant difference in phonological awareness between their reading disabled and non-disabled groups. This study showed a significant difference in phonological awareness between third grade and fifth grade, and



the non-disabled group performed significantly better than the reading disabled group. Within this study a deficit in phonological awareness was shown in children with poor reading ability.

In a study by Lobello, Wolf, Gulgoz, and Doleys (1998) ten regular students and ten reading disabled students within the ages of seven to thirteen were tested by showing two sets of 36 words on a screen. One set of words were placed on various colored backgrounds of pink, red, green, blue, orange and yellow and another set of words were placed upon a white background. The students were told to read the word as it appeared on the screen. The results concluded that colored backgrounds were not significantly related to phonological processing ability and varying the background color did not help students read words on a screen. However, phonological processing skills were varied between students with reading disabilities and normal readers and Lobello et al. (1998) stated the coordination of optimal color to each individual could have made a difference in the results of this study.

Reading disabled students had a problem with the level of retrieval and the rate at which they read. Verbal fluency studied by Eden, Stein, Wood, and Wood (1995) showed there were significant differences between the non-disabled and reading disabled groups. Children with reading disabilities read at a slower rate due to phonological awareness deficits. It is important to make connections between prior grapheme/phoneme knowledge and recognition to words that are unknown, thus increasing fluency of text. Being able to decode words and read at a fluent rate may increase reading comprehension.

When there is an understanding of phonological awareness, one can benefit from phonics instruction. Just the understanding of the basic principles of alphabets allows the child to know there are relationships between written letters and spoken sounds helping children recognize familiar words accurately and automatically and to decode unfamiliar words effortlessly, allowing comprehension to take place.

### Fluency

The National Institute of Child Health and Human Development (2000b) revealed fluency as an important element in being a skilled reader. It is an essential piece of the reading comprehension puzzle. Fluency requires rapid recognition of words, ending punctuation recognition, determination of pauses in text; all for the increase of comprehending what is being read by “freeing cognitive resources for interpretation” (National Institute of Child Health and Human Development, 2000a, p. 3-6). “For children to understand what they read, they must be able to read words rapidly and accurately” (Armbruster, Lehr, & Osborn, 2001, p. 6). During reading, multiple tasks such as word recognition and comprehension are performed in unison as a reader reads text with speed and accuracy, allowing the reader to simultaneously perform other cognitive functions such as inferencing.

In a study by Walczyk and Griffith-Ross (2007), they determined the more fluent the reader, the higher the comprehension. Walczyk and Griffith-Ross (2007) declared reading fluency increased by utilizing strategies and compensating when coming across unfamiliar words. These strategies included but are not limited to paying attention to the reading rate, pausing, rereading, oral reading, sounding out, skipping unfamiliar words, and glancing back to what was already read. “Readers with less fluent skills

compensated more often (e.g., slowed reading rate, paused, looked back, reread). More fluent readers compensated less” (Walczyk & Griffith-Ross, 2007, p. 563). Fielding and Pearson (1994) affirmed poor comprehending students are less likely to invent effective strategies on their own. These strategies need to be taught. Eden, Stein, Wood, and Wood (1995) stated “good automatization indicates that a child requires less processing time to name, for example, a letter, and automatization is a prerequisite for reading” (p. 284).

There are two ways to increase fluency. One is oral reading and the other is independent reading. Stayter and Allington (1991) claim practice with oral reading leads to the development of self-awareness and the increase of thinking while reading. Oral reading “has the potential to help readers develop more resonant understandings of text (Stayter & Allington, 1991, p. 145). Fielding and Pearson (1994) found when the text became difficult, oral reading increased comprehension. Walczyk and Griffith-Ross (2007) found reading orally for third graders significantly increased comprehension due to paying attention to difficult text. Also within this study fifth graders increased reading comprehension by both reading silently or orally. They seemed to be in a transitional phase of reading orally to pay attention to text and could read silently for the same purpose at the same rate. Independent or silent reading fostered successful comprehension with exposure to vocabulary, independence, and motivation caused by interest reading. When the text is interesting to the reader, comprehension increases (Fielding & Pearson, 1994).

Studies have shown various uses of color affects reading fluency. In a study by Iovino, Fletcher, Breitmeyer, and Foorman (1998) blue overlays significantly decreased

the reading rate in students with reading, spelling, math disabilities and ADHD, while increasing reading rates in other children, improving reading comprehension overall ( $F(1, 56) = 3.65, p = .06$ ). “Fifty-seven percent of the sample demonstrated a sizeable improvement in reading accuracy relative to baseline performance using a colored transparency” (Iovino et al., 1998, p. 799). In another study by Jeanes et al. (1997), continuous usage of overlays improved primary students’ reading speed by an average of eight percent ( $t(10) = 2.68, p = .011$ ). This study also found “the increase in speed resulting from use of the overlay(s) was associated with an increase in accuracy (a decrease in errors)” (Jeanes et al., 1997, p. 537).

Wilkins, Sihra, and Myers (2005) concluded in a study the use of coloured glasses helped to increase reading speed and fluency. With the selection of a chromaticity that provided the best clarity, participants were given different passages of text using a variety of coloured lights. The reading speed was for the average 21% slower with white light than using coloured light. “When coloured filters are used the excitation that results from visual stimulation is redistributed in such a way as to reduce excitation in local areas of hyperexcitability” (Wilkins, Sihra, & Myers, 2005, p. 116). In a multiple examination study by Wilkins, Lewis, Smith, Rowland, and Tweedie (2001) children repeatedly chose the same colour with regard to overlays and it was these children who showed the biggest improvement in reading speed with their optimal color. “The chosen overlay was associated with a significantly greater rate of reading than no overlay ( $t(372) = 5.67; p < 0.00001$  one tailed)” (Wilkins et al., 2001, p. 52). Other than the use of no overlay, grey was the least significant colour chosen and showed the least gains in reading speed.

The National Reading Panel states the way to improve reading fluency is to read more (National Institute of Child Health and Human Development, 2000b). Words need to become automatic and associations of similar words help to increase a reader's fluency. Motivation and interest reading combined with knowledge and use of strategies increases fluency, which leads to comprehension of text (Berninger, Abbott, Vermeulen, and Fulton, 2006).

### Intelligence

Stothard (1994) conveys poor comprehending students to have a deficit in verbal intelligence (IQ). In a study performed on second graders, Berninger, Abbott, Vermeulen, and Fulton (2006) showed significance in correlations with four of their reading comprehension measures and verbal IQ. Berninger's et al. (2006) study was based on the functional systems theory of reading comprehension which encompasses many different processes, all working in unison, to support a "functional reading system in the learner's mind to support efficient, fluent reading" (Berninger et al., 2006, p. 335). Two studies were performed. The first study concentrated on deciding what measures improved reading comprehension. Consistent correlations made across the school year showed accuracy and speed as being stronger predictors of reading comprehension. The improved reading rate of larger chunks of text significantly affected verbal reasoning ability and had an influence on verbal working memory span, thus positively affecting verbal IQ, and improving reading comprehension. The second study was expanded to include all second graders in all schools within the school district. Schools were randomly assigned as treatment or control groups. Reading clubs were offered to students in the treatment groups. These clubs reinforced word play (phonemic

awareness), word work (accuracy and automaticity), story reading, and final word play (extension of words). Individual differences in phonological and phonemic awareness, rate of reading, and vocabulary knowledge significantly influenced reading comprehension achievement (Berninger et al., 2006). “Verbal IQ may be a predictor of early reading comprehension” (p. 347).

Intelligence is shown to determine verbal memory abilities (Eden, Stein, Wood, & Wood, 1995). In the study by Eden et al. (1995) verbal memory abilities were tested by reading a story to the participants and asking for immediate recall and an hour delayed recall. There weren't significant differences between the non-disabled group and the reading disabled group in recalling a story, but the lower IQ group did significantly poorer. Participants with lower intelligence also performed worse than other groups on tests regarding phonological awareness and naming. Within this study, children with disabilities adapted and used other senses to make up for the areas that appeared weak. The children with disabilities other than lower IQ had an average to above average verbal memory ability (Eden, Stein, Wood, & Wood, 1995).

There's much a parent can do to increase their child's intelligence, leading to higher rate of comprehension. Hart and Risley (1992) found the differences in parent utterances and words used to interact with their child strongly correlated with the child's IQ. The more questions a parent asked, repeated words, and parental topic elaborations, the higher the child's IQ. The more prohibitions uttered by the parent to the child, the lower the child's IQ. Children with poor language comprehension tend to have reading comprehension problems as well.

The U.S. Department of Education (1999) declared normal ranges of intelligence do not determine how easy a child learns to read. It takes the combination of phonemic awareness, fluency, rate, and verbal intelligence to have an impact on reading comprehension (Berninger et al., 2006).

### Behavior

Learning to read and comprehend text requires concentration, effort, and attention. According to Jacobson and Lundberg (2000), children with serious socio-emotional problems are in general expected to have a harder time learning difficult things in school. In a study by Her Majesty's Inspectors (HMI) over 1,550 reports of inspections of schools in Great Britain were filed, describing behavior in primary and secondary education (Ofsted, 2005). Many of these schools were visited at least twice. They focused on two specific types of challenging behavior: overtly aggressive behavior and excessive verbal abuse. They stated that challenging behavior was exhibited mostly in students who had "poor language skills, social skills, and emotional development" (Ofsted, 2005, p. 20). They determined two thirds of students with challenging behavior were two or three years behind in reading as compared to their peers and therefore struggled to read and comprehend material. They also were apt to write poorly. The Inspectors recommended using curriculum flexibility to address the students' interests, as well as vocational training. It was suggested schools address the student's needs through a variety of activities and resources designed to improve and accelerate academic, social, and behavior issues.

"The attention problems in children with Attention Deficit Hyperactivity Disorder (ADHD) result in a number of behavioral characteristics which may interfere with

academic tasks” (Imhof, 2004, p. 191). Imhof (2004) indicated these students often forget what they are supposed to do and do not complete tasks at hand. Their difficulty in sustaining attention for any length of time may cause them to miss important information and not process the information that is given to them. They have a harder time with (grapho)motor behavior, motor coordination, attention and motivation regulation, and controlling working memory, all of which relate to cortical activation (Imhof, 2004).

The use of color stimulation for reading and writing purposes decreases attention deficits and helps with motor process control according to a study by Imhof (2004). In this study entire classes of second and third grade children, which included children with ADHD, unknowingly participated in experimental tasks. All ADHD children had been diagnosed using DSM-IV criteria by a child psychiatrist and a school psychologist, as well as a scale completed by teachers and parents. ADHD students who were already placed on medication were excluded from further processing. The final sample in this study consisted of 44 boys with ADHD, 12 pairs of regular education boys (RE), 20 with speech disorders (SD), and 12 who were learning disabled (LD). Each boy with ADHD was compared with a non-ADHD partner with regard to gender, class, and time on task and the results compared between the two.

All procedures in statistics were performed using control groups for all other types of students as well: SD, LD, and RE. All the children in this study received either white paper or chose their favorite colored paper from a range of pastels to fluorescent hues for the purpose of copying spelling words from an overhead projector. Imhof (2004) stated children with ADHD “react to color stimulation in a very specific manner” (p. 192). Children with ADHD showed fewer mistakes and made better use of time



completing tasks on colored paper than on white paper. The use of colored paper also increased the ADHD students' writing legibility and neatness.

Iovino, Fletcher, Breitmeyer, and Foorman (1998) stated recent "hypotheses suggests that low-level visual processing impairments, represented by deficits in the transient channel system, may affect reading skills in many disabled readers" (p. 1). According to Iovino et al. (1998) "many children with RD have attention problems" (p. 793). In one study by Iovino et al. (1998) 60 children and adolescents from ages 8 to 18 years were placed into four categories based on their performance on reading decoding and math assessments. The four categories were: Reading-Spelling-Arithmetic disabled (RSA), Reading-Spelling disabled (RS), Arithmetic disabled (A), and Attention Deficit/Hyperactivity Disorder without learning disabilities (ADHD). All ADHD children on medication were asked to continue taking their medication while participating in the study "to reduce effects of attention deficits in reading performance" (Iovino et al., 1998, p. 794). This study showed the use of red overlays improved reading comprehension performance with ADHD children and blue overlays significantly improved reading comprehension performance regardless of being ADHD, reading disabled, or a non-disabled reader. Blue overlays significantly reduced reading rates in all readers, reflecting the possibility that slower reading rates increase attention to print and higher reading comprehension performance (Iovino et al., 1998).

In a study by Belfiore, Grskovic, Murphy, and Zentall (1996) three students ages 10 to 11 were identified with ADHD by their physicians and the use of a scale given to their teachers. All three students were identified with learning disabilities and were reading at least two grade levels below their peers. In the first part of the study unknown

sight words were presented in different formats: black words on white index cards and black words or white words on a colored box located in the middle of the card, surrounded by a white area and colored trim. The findings showed students learning sight words equally well with black on white and colored box formats. In the second part of the study, all three students were given comprehension tests compiled using stories on the students' appropriate reading level. Stories were obtained from the SRA Developmental 1 and SRA Developmental 2 reading laboratories. The SRA stories were printed using black ink on white paper and another set using black ink on white paper, but highlighted in assorted colors. In each session students were to read a black and white story, followed by the same story highlighted in color. Each story was followed by a page of 10 comprehension questions. There was a substantial increase in comprehension using the highlighted story for all three students. It was determined that "nonspecific color added to the later part of a lengthy task, but observable throughout the task, may help students with LD and ADHD sustain their attention through (a) early training sessions and (b) initial phases of tasks of long duration" (Belfiore et al., 1996, p. 436). Belfiore et al. (1996) maintain reading comprehension, not reading recognition, may positively be affected by the use of color in children who have disabilities or behavioral issues.

Color may have an impact on helping children stay focused for longer periods of time, therefore increasing attentiveness to detail and improving comprehension. Comprehension is affected when attention is given to the fluency of words as they are read and background color may be a key to increasing reading comprehension, especially with students who are behaviorally challenged.

## Visual Acuity

Williams, LeCluyse, and Rock-Faucheux (1992) allege the deficits in visual acuity stem from the dual processing systems in vision; transient and sustained. Visual processing includes the interaction between the transient (responsible for the direction of the eye to specific words on a page) and sustained (discerns details of letters) subsystems (Williams et al., 1992). In a study performed by Williams et al. (1992) seventy children (32 regular and 38 specifically reading disabled) between the ages of 8-12 were given three conditions for which white text appeared on a black computer monitor screen. The first condition was reading a text one word at a time in the center of the screen. Eye movements were not required for this type of reading. In the second condition, passages were presented one line at a time. Eye movements were required, but guided, as words appeared before them one at a time in a left to right flowing manner. In the third condition, the text was presented one line at a time, but with all the words appearing simultaneously. In separate conditions, the computer monitors were covered with blue or red overlays. In both regular and reading disabled readers, the blue overlays increased the processing time of the transient system; whereas the red overlays decreased the processing rate.

Williams et al. (1992) completed a second study and in addition to the blue and red overlays, introduced a light gray background color. The results were the same as in the first study with one exception. There was an increase in reading comprehension solely for the reading disabled readers using the light gray background color.

Approximately eighty percent of the students in this study responded to a simple

intervention and increased their reading performance as a result of changing background color (Williams et al., 1992).

Eden, Stein, Wood, and Wood (1995) studied the phonological and visuospatial abilities of four groups of children: nondisabled, reading disabled, backward readers with an IQ below 85, and miscellaneous children who didn't fall within the previous groupings. Several verbal and visual tests were administered such as tests in phonological awareness, verbal memory, naming tests, fixation control tasks, and tests in vergence ability. This study showed "children with reading problems often experience both phonological and visuospatial problems" (Eden et al., 1995, p. 288). Eden et al. (1995) explained impairment of the visual transient (magnocellular) system may lead to reading fluency and comprehension problems due to a reduced saccadic suppression. This causes vertical tracking and vergence ability eye movement problems by fixating on the previous image viewed and therefore causing a type of ghost effect as the eyes move across the reading material. This leads to uncertainty while reading words, which leads to fluency and phonological problems hindering reading comprehension.

In a study by Iovino, Fletcher, Breitmeyer, and Foorman (1998) "reading difficulties attributed to transient system dysfunction occur when reading connected text, a deficit that can be explained in most disabled readers by their inability to decode single words" (p. 801). They also stated colored overlays positively affect the reading comprehension of readers with or without a disability, probably due to the transient channel system function affecting the cognitive processes. There appears to be different types of visual problems in children with reading disabilities as stated in a study by Eden, Stein, Wood, and Wood (1995). Jeanes et al. (1997) stated "even if the magnocellular

deficits are more prevalent than is currently envisaged and are responsible for visual dysfunction in children who use coloured overlays, it is quite unclear at present how this dysfunction can be reduced by the use of the overlays, given that each individual appears to benefit from a different colour” (p. 541). Wilkins et al. (2001) assert comfortable colors may reduce strong excitation in the hyperexcitable regions of the visual system, causing availability to focus on print without textual distortions. Singleton and Trotter (2005) found the ability of their groups to read text faster with the use of optimal colour. “In the dyslexic high visual stress group there was a mean 16% increase in reading speed when using optimal colour” (Singleton & Trotter, 2005, p. 372). Color may have an impact on visual processing of text.

#### Light Sensitivity

Evans (1974) revealed the physical causes producing color perception originates with energy and wavelength. Light travels with such velocity as wavelengths and results in being absorbed, transmitted or reflected. The various directions of these wavelengths as they bounce off objects, along with the lens of the eye form an image on the retina. According to Evans (1974) wavelengths of light enter the eye lens and “this light is the true stimulus for color vision” (p. 13).

Light can influence reading fluency and comprehension. There are light sensitive elements in the retina of the eye called rods and cones. There are six to seven million cones and ninety-three to ninety-four million rods, but only one million fibers which carry the responses of these rods and cones out through the optic nerve (Evans, 1974). The differences in the rods and cones depend on the minimum intensity of the light to which they can respond (Evans, 1974). Grangaard (1993) affirmed the rods determine

brightness and it's the quality of the lightness that is the source of color perception.

Vision at low levels of light intensity is called scotopic.

Irlen (1991) claims that people who have difficulty processing full-spectrum light efficiently are found to have Scotopic Sensitivity Syndrome (SSS). Approximately fifty percent of people with reading problems or learning disabilities have SSS. Scotopic Sensitivity Syndrome deals with the spectral modification of light and is a perceptual dysfunction of the print, not a weakness in the visual system (Irlen, 1991). "It is not a learning disability on its own, but a complex and capricious condition often found in people with attention deficit disorder, dyslexia, dyscalculia, and many other learning disabilities, causing problems with reading fluency and comprehension" (Irlen, 1991, p. 31).

"Scotopic Sensitivity Syndrome encompasses five factors: light sensitivity, inadequate background accommodation, poor print resolution, restricted span of recognition and lack of sustained attention" (Irlen, 1991, p. 31). For some people, SSS causes other problems as well. They may have trouble with their attention span, handwriting, gross motor activity, energy level, motivation, musical ability, sports performance, and driving abilities. Using colored overlays or colored filters has helped SSS students with reading fluency and comprehension problems by altering the spectral content of the light (Irlen, 1991).

The effects of fluorescent and natural lighting generate another type of light related issue. Waldecker (2005) explained the benefits of natural lighting in classroom learning. These benefits included higher scores on standardized tests in math and reading, fewer absences, and less behavior issues. Altering the physical environment and

allowing natural daylight into the room provides an opportunity to help students succeed. The Heschong Mahone Group (1999) found that by providing natural daylight as a major lighting source within the classroom allowed for a minimum of 7% to 18% higher scoring in reading and math on standardized tests. Classrooms with vast amounts of natural lighting performed at a 20% to 26% faster learning rate compared to classrooms containing least amounts of natural daylight. Large areas of windows were associated with a 15% to 23% faster rate of learning as compared to classrooms with fewer windows. This gain was higher in classrooms where blinds or curtains were present to allow for teacher control of glare or visual distractions (Heschong Mahone Group, 2003). Utilizing daylight along with direct/indirect lighting fixtures allows for the maximization of learning and conservation of energy (Frazier, 2006).

### Color

Elliot, Moller, Friedman, Maier, and Meinhardt (2007) state “color is ubiquitous in individual’s perceptual experience of the world” (p. 154). Less than 8% of males and 1% of females are somewhat color deficient, yet color has been noted to affect humans physically, psychologically, and academically (Pett & Wilson, 1996).

There are several factors relating to color affecting cognitive processing. Color has an influence on our behavior, thought processes, and moods (Clifton, 2006). “Happy moods may lead to nonsystematic, less detail-oriented, and more heuristic processing; whereas sad moods lead to more systematic, more detail-oriented, and less heuristic processing” (Sinclair, Soldat, and Mark, 1998, p. 130). Colors may serve as affective cues. Sinclair et al. (1998) also proclaim “students whose examination forms are on colors that convey more positive affect may process information less systematically,

leading to differential performance on the examination” (p. 130). Pett and Wilson (1996) ascertained color affects moods. Colors that are cool and calming stem from the blue end of the color spectrum. Exciting and warm colors derive from the red end of the color spectrum. Goldstein (1942) established psychological experiences are triggered by physiological reactions to color. Performance may be altered by our associations to color. Colors from the red end of the spectrum focus our attention outward, whereas the blue end of the spectrum focus our attention inward. In a study by Elliot et al. (2007) color “can also influence motivation without one’s conscious awareness” (p. 166). An effect for color was determined in each of their varied experiments. Participants associated the color red with failure by producing anxiety and significantly poorer performance than those in other colored conditions, even to the point of subliminally evoking avoidance motivation with regard to the red color.

Color interpretation may also be influenced environmentally. Özgen (2004) declared we learn colors by what we are told. Objects are labeled colors and in turn our memory associates that object with the prescribed color. “It is remarkable to think that even the most fundamental perceptual mechanisms, such as those involved in the perception of colors, can be influenced by the environment, including culture and language” (Özgen, 2004, p. 98). Elliot et al. (2007) stated multiple negative associations to the color red stem from our environment. “Most specifically and directly, the repeated pairing of red with mistakes and failures that is encountered by most children in the educational system (e.g., incorrect answers marked with red ink) teaches them to associate red with failure in achievement contexts” (p. 156). The link between danger and the color red stems from stoplights, sirens, fire alarms, and warning signs.



“Perceptual learning is one way in which the brain adapts to the demands of the environment, resulting in such physiological change. It seems unlikely that color perception is a special case – a rigid mechanism that is the same regardless of the environment” (Özgen, 2004, p. 97).

According to Irlen (1991) the use of colored lenses in glasses has helped many people with Scotopic Sensitivity Syndrome (SSS) increase their reading ability. The spectral content of light can be changed with the use of colored filters and this causes stability of the print, which in turn causes an increase in reading fluency and comprehension. Other interventions can be implemented once the perceptual problem is under control. Optimal performance in the rate of reading can be the result of an individual’s background color choice while reading information printed with black ink (Wilkins, Sihra, & Myers, 2005). In a 12 month optimal colored lens study by Robinson and Conway (1990) there was “consistent improvement in comprehension performance across all testing phases, with a slightly greater increase occurring in the initial 3-month interval” (p. 592). Testing was completed at the end of three, six, and twelve month intervals. The rate of reading increased with each testing interval with the use of optimal choice colored lenses.

Colored filters in frames may contain a different color than the one that is individual specific as in used for colored overlays. Surface color is affected by the use of overlays whereas the light source is affected by the use of colored lenses (Lightstone, Lightstone, & Wilkins, 1999). Irlen (1991) ascertains the difference in the way the light enters the eye with colored filters is not the same as the way light is reflected from the page using a colored overlay. Sometimes it may be necessary to use more than one

avenue for color. For instance, a combination of colored filters and a colored overlay or colored paper and colored filters would be needed for optimum reading fluency and comprehension of reading material (Irlen, 1991). According to Jeanes et. al (1997) “The overlay provides one coloured surface in a visual field containing many differently coloured surfaces, and the eyes are adapted to white light. When coloured glasses are worn the entire visual field is coloured, the eyes adapt to the colour, and, partly as a result of that adaptation, the colour is discounted by mechanisms similar to those that underlie colour constancy” (p. 2).

Colored overlays provide an avenue for increased text perception. In a study by Jeanes et al. (1997) 89% of students who received overlays continued to use them three months later and 70% stated they wanted to keep the overlay. After ten months 32% of primary school students and 9% of secondary school students were still using their overlay. Improved text perception was recorded in elementary students (51%) and in secondary school students (54%). Similar results were found in a study by Wilkins et al. (2001), 60% of children participating in Study 3 reported text perception improvement using colored overlays, with 52% continuing to utilize the overlays eight months later. Positive changes in text tracking, watering eyes, eye movements, reading fatigue, and clarity in text perception was noted by Rickelman and Henk (1990) with the use of an appropriate colored overlay.

Colored paper adds a different dimension than the use of overlays and glasses. A study by Skinner (2004) determined the use of colored paper for an undergraduate midterm exam did not enhance performance scores. Colored paper exams were utilized for the purpose of controlling cheating, without regard for individual color preference.

The result of this study showed a decrease in performance scores as compared to the white paper group. This may confirm that the effects of color on reading fluency and comprehension are individual specific (Skinner, 2004). Johnston (1984) utilized blue colored paper and white paper for the testing of secondary vocational agriculture teachers to see which color had higher readability. It was concluded that either blue or white background color does not affect readability of material. In a study by Sinclair, Soldat, and Mark (1998) psychology college students were given the same midterm exam on either Astrobright lunar blue or Astrobright rocket red paper. Color had a main effect ( $F(1,3) = 5.84, p < .03$ ), with the blue paper participants ( $M = 66.63, SD = 15.35$ ) outperforming the red paper participants ( $M = 56.45, SD = 12.73$ ). “Blue paper led to better performance than red paper, particularly for difficult questions” (Sinclair et al., 1998, p. 131).

Color adds a different dimension when relating to the eye and the ability to see print on a page. Irlen (1991) declares the best paper colors to use in the classroom are beige, yellow, goldenrod, pink, blue, and green for the purpose of reducing distortions and increasing readability. The use of colored filters, colored overlays, or colored paper will not eliminate the reading difficulties with phonetics, sound blending, or a weak vocabulary; it will only eliminate the perceptual problem of print on the page. Color perception is influenced in many ways and may be ever changing. Utilizing color for reading fluency and comprehension is continually being researched and implemented as a reading strategy for all types of learners.

## Hawthorne Effect

According to Merrett (2006) the Hawthorne Effect “is frequently referred to by researchers to account for unexpected outcomes which are believed to depend on the fact that the subjects in a study have been aware that they are part of an experiment and are receiving extra attention as a result” (p. 143). The initial focus of the Hawthorne studies which took place at Western Electric Company in Chicago, Illinois, between 1927 and 1932, was placed on illumination of the workplace. Workers worked under varying lighting intensities and their productivity increased even when said conditions did not take place. Group productivity increased even when illumination was not increased due to the amount of attention they received and the fact they were involved in an experiment. “It is not only what is done to alter conditions of work but how it is done, by whom, and with what accompanying information, as well as the perceptions of such changes by those directly affected by them, that are important” (Merrett, 2006, p. 146).

When performing a study one needs to be aware of the Hawthorne effect and look for any specific psychological and/or social variables that may affect the outcome of such study, even if these were not monitored during the study, as well as any possible effects on observed results.

## Summary of Literature

Calvo (2004) insists it is difficult to predict who will become a successful reader. Reading acquisition is a complex process and depends upon a large number of factors from parental involvement to a variety of individual cognitive and visual abilities (Jacobson & Lundberg, 2000). There are many things which may affect the reading process. Scotopic Sensitivity Syndrome encompasses the spectral modification of light

and the perceptual dysfunction of print. Sensitivity to light and color may have a bearing on vocabulary knowledge and inference capabilities, the ability to decode words, read fluently, and comprehend the printed material. Using colored overlays or colored filters changes the way eyes perceive the spectral content of light (Irlen, 1991). The use of colored paper, colored overlays, and colored filters may increase reading comprehension simply by taking away the distraction of a white background and putting the focus on the print, improving reading comprehension for all kinds of readers.

Many factors impact a person's ability to read. According to a study performed by Hafner (1991) academic achievement can be positively influenced by increasing word recognition, vocabulary, listening skills, and general knowledge. Increasing these factors will help provide academic success throughout life, as well as the use of color.

## CHAPTER III

### METHODS

#### Introduction

The purpose of this study was to determine if using black text on colored background would increase reading comprehension and vocabulary scores as compared to the use of black text on white background. This study was conducted over a one month period and involved all fourth graders at Cannon Street Elementary School, in Troup County, Georgia, during the 2006-2007 school year. Student scores were compared using goldenrod, Astrobright blue, green, and white paper to see which color provided higher test scores. The following research questions were addressed:

1. What, if any, are differences in scores between students who took their reading tests on goldenrod, Astrobright blue, or green colored paper as compared to tests taken on white paper?
2. What, if any, are the differences between the reading scores of regular education students, gifted students, students with academic difficulty, special education students and students with speech difficulties who took their tests on colored paper as compared to tests on white paper?

#### Design

There are basically two divisions of children's books: fiction and non-fiction. Picture books and chapter books are available in each of these categories. Chapter books

are separated into chapters as a way to introduce multiple quantities of settings, characters, plot, and chronological divisions or subjects. Chapter books are introduced to students in the upper elementary school years as a way to increase reading comprehension and extend the length of relevant reading material. Burch's (1980) chapter book *Ida Early Comes Over the Mountain* was chosen for this study because it was a fourth grade reading level book and could be used to address Georgia performance standards. The Georgia Department of Education (2005-2006) designed standards for teachers to teach in all subject areas. The Georgia performance standards addressed with the teaching and reading of *Ida Early Comes Over the Mountain* included: English Language Arts (ELA) standard number 4R1 – The student demonstrates comprehension and shows evidence of a warranted and responsible explanation of a variety of literary and informational texts, ELA4R2 – The student consistently reads at least twenty-five books or book equivalents (approximately 1,000,000 words) each year.

The materials should include traditional and contemporary literature (both fiction and nonfiction) as well as magazines, newspapers, textbooks, and electronic material. Such reading should represent a diverse collection of material from at least three different literary forms and from at least five different writers, ELA4R3 – The student understands and acquires new vocabulary and uses it correctly in reading and writing, and ELA4R4 – The student reads aloud, accurately (in the range of 95%), familiar material in a variety of genres, in a way that makes meaning clear to listeners.

Weekly comprehension and vocabulary tests were designed to assess the students' knowledge. Four chapters, one chapter each day Monday through Thursday, were read orally by the teacher and reread by the students each week. Every Friday, students took

comprehension and vocabulary tests over the previously read four chapters. The same tests were given to every student. The test format was the same each week, even though the material on each weekly test was different.

This type of assessment led to the decision to use colored paper to increase reading comprehension of assessments with a focus on vocabulary. The teachers, principal, instructional assistant, and superintendent at Cannon Street Elementary and Troup County Schools were in agreement to use colored paper for assessment purposes. The Auburn University Institutional Review Board (IRB) for the Use of Human Subjects in Research was approached and solicited for approval of using fourth grade students at Cannon Street Elementary for this research. Parents were notified via information letter. A fourth grade class meeting was held and students were told about the upcoming colored paper assessments. The teachers explained to the students they would be taking their assessments on different colors of paper and that each student would receive all colors within a four week time period.

The design of using colored paper included a plan of how the paper was to be distributed. Students were arranged in alphabetical order in a Microsoft Excel program. Each child was assigned a number. In Class A, on Friday of the first week the first six students were given their vocabulary and comprehension tests on blue paper, the next six students were given goldenrod paper, six students were given green paper, and seven students were given white paper. In Class B, the first seven students were given their vocabulary and comprehension tests on blue paper, the next six students were given goldenrod paper, six students were given green paper, and seven students were given



white paper. The colors were rotated weekly so all students received all colors within a month's period of time.

### Sample

Cannon Street Elementary is located in LaGrange, Georgia, Troup County, in the west central region of the state of Georgia. It is one of thirteen elementary schools within the county. Cannon Street Elementary is located near the center of the city of LaGrange.

Cannon Street Elementary School's student population was comprised of three hundred African Americans, ninety-three white Anglo Saxons, sixteen Inter-racial students, four Hispanics, and two American Indian/ native children. There were two hundred twenty-five males and one hundred ninety females for a total student population of four hundred fifteen for the 2006-2007 school year. The majority of the students came from low socio-economic families as determined from parental surveys and the amount of students who received free or reduced lunch. Eighty-six percent of the student body received free or reduced breakfast and or lunch. Twenty-seven percent of the student population had been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and had been placed on medication. Based on teacher observations and checklists, the number of ADHD students was higher and closer to fifty percent of the student body, but twenty-three percent were not medically diagnosed, nor on medicine.

The fourth grade student body was comprised of fifty-one students, twenty-two females and twenty-nine males: sixteen African American females, twenty-one African American males, four white females, eight white males, one American Indian/ female, and one interracial female. Seventy-six percent of the fifty-one fourth grade students ate free or reduced breakfast and/or lunch.

Cannon Street Elementary had two fourth grade teachers for the 2006-2007 school year. Class A was comprised of twenty-six students. Two of the twenty-six students were gifted. Two students were in speech. One student was in the student support team (SST) process and was diagnosed academically delayed. Class B contained twenty-five students. One student was gifted. Three students were in the SST process and were diagnosed with learning problems: behavior issues and/or learning disabilities.

Beck and McKeown (2007) alleged there are profound differences in vocabulary development and knowledge in children from different socioeconomic groups. Biemiller (2003) found children from low socioeconomic households obtain a vocabulary of about 3,000 words by second grade as compared to the acquisition of about 7,000 words from an average middle-classed socioeconomic household. This appears true and relevant of the students from Cannon Street Elementary School. The students' lower socioeconomic status revealed a deficit with regard to their vocabulary knowledge as determined by the Lexia Comprehensive Reading Test (Lexia CRT). The two fourth grade group average scores on the reading informal part of the Lexia CRT were for Class A and Class B respectively: 16.42 and 14.75 out of 45 possible points. These scores also exposed weaknesses in reading comprehension with regard to detail, inferencing, sequencing, cause and effect, main idea, as well as vocabulary.

Moats (2001) states "Above all, students must read as much as possible in text that is not too difficult for them to close the huge gap between themselves and other students" (p. 39). Keeping in mind the student population of fourth graders at Cannon Street Elementary School, the reading of chapter books and extensive vocabulary instruction was chosen to enhance the acquisition of reading comprehension with the use

of colored paper as the medium to accelerate the students' ability to understand text and acquire word knowledge.

#### Instrumentation

Weekly comprehension and vocabulary tests on the book *Ida Early Comes Over the Mountain* were given to every fourth grade student for a period of one month. Each of the four weekly comprehension tests were designed in an identical question format that included six multiple choice, four true/false, and five short essay. Multiple choice questions included one correct answer, two incorrect answers and one stated as none of the above. Students were asked on the true/false section to correct any false statement by rewording the incorrect statement to make that statement true. The short essay questions were to be answered using complete sentences. All tests were written with the following grading scale: zero to one hundred, with the highest possible score being one hundred and the lowest possible score being zero. Each question of multiple choice, true/false, and short essay carried the same weight. The same weekly tests had been used for several years and have proven valid and reliable for use with the book *Ida Early Comes Over the Mountain*. Validity and reliability was based on the delivery of material which was reflective of the test questions. Test questions were designed to reflect the material the students were exposed to on a weekly basis. Activating strategies gave students the opportunity to be exposed to material that would be covered on the tests. Students participated in activities throughout the week which gave them hands-on knowledge as to how to answer the short answer essay questions. The delivery of the vocabulary words was the same each week. Students were introduced to unknown words at the beginning of the week and they used these words throughout the week in hands-on activities. This

same comprehension question format was also used for other fourth grade chapter books throughout each year such as *Stone Fox*, *Sign of the Beaver*, and *The Cricket in Times Square*. All students were familiar with the testing format since they read *The Cricket in Times Square* and other chapter books prior to using colored paper for test taking purposes. This would address any reference to the Hawthorne Effect as explained by Merrett (2006).

During the week, oral comprehension questions were asked by the teacher after each chapter read to prepare the students for similar questions on the comprehension test. These daily discussions about the chapter led to a question and answer session for clarification of the text. A study guide was not provided nor used with any comprehension test.

Each weekly vocabulary test was designed using a fill in the blank format in which the student placed the appropriate vocabulary word in the sentences provided. The sentences were designed specifically with the definition of the word in mind and a clear understanding of which word would fit in the blank as matched to the meaning of the text. Ten vocabulary words and their definitions were introduced each Monday. Activities were planned daily for vocabulary usage and definitions practiced in order to prepare the students for recognition of the cloze format used on the test. Some of the activities included: making index cards with words and definitions on the front and illustrations of the word meanings located on the back of each card, a game of concentration was played by groups of two to three students using the index cards each student designed as the playing cards, sentences were developed using each word in context, and the students acted out each vocabulary word similar to charades with a

student doing the acting while other students were calling out the word as it was played out. All the activities were designed to involve the students in the active learning of new words.

The vocabulary test was designed with blanks at the top of the page. The teacher called out the vocabulary word and the students wrote the word in the blanks. After the words were written at the top, the students placed the appropriate word in the correct blank. The test was collected when the student used every word in the provided sentences using the cloze procedure. Misspelled words did not detract from the overall grade.

These tests were run to see how regular education students scored using colored paper for comprehension and vocabulary assessments as compared to students receiving special services such as gifted, speech, or SST. Because the students were familiar with the test taking process and test format, little attention was drawn to the color of the paper given to an individual. A discussion introducing the tests on colored paper took place prior to giving the first test. Students were aware they were going to be given the same tests on different colors and all students would receive all colors within a month's time period.

#### Data Collection and Procedure

Fifty-one tests in reading comprehension and vocabulary were copied onto four different colors for four weeks: goldenrod, Astrobright blue, pastel green, and white. The comprehension tests were printed on one sheet front and back. The vocabulary tests were printed on one side of the paper only. Students were given both sheets, one at a time, every Friday until every student received their tests on every color.

In Class B on Friday of the first week six students were given their vocabulary and comprehension tests on Astrobright blue paper, six students were given goldenrod paper, six students were given green paper, and seven students were given white paper. In Class A seven students were given their vocabulary and comprehension tests on Astrobright blue paper, six students were given goldenrod paper, six students were given green paper, and seven students were given white paper. The colors were rotated weekly so all students received all colors within a month's period of time.

The tests were consistently graded by the Class A and Class B teachers every week. Two grades were given: one for the comprehension test and one for the vocabulary test. The grades were recorded weekly on Excel spreadsheets. All scores for comprehension were placed on one Excel spreadsheet and all scores for vocabulary were placed on another Excel spreadsheet. At the end of four weeks, scores for comprehension and vocabulary were entered into an SPSS statistical software program for analysis. There was an examination of student grades and paper color over time as well as the use of independent variables. These variables included students who were gifted, in regular education, and students who were disabled in some way to include speech, learning disabled, or in the Student Support Team (SST) process. Students who were in the SST process had consistent academic difficulty but were not diagnosed with a learning problem.

A repeated measures statistical analysis was used to determine whether there was statistical significance in student scores using different colored paper over a month's period of time. In addition, tests were run according to the independent variables of student types. A repeated measures statistical analysis is designed so each level of each

variable can be paired with each level of another variable (Reese, 1997). This type of test was conducive for comparing all colors of paper within the three variables over time.

### Summary

There are many types of individual learners. Socioeconomic status, ability, and intelligence develop the nature of the individual; it tells how you learn and determines who you are as a person. Nurture is developed by utilizing the learned information (James & Maher, 2004). The majority of the students at Cannon Street Elementary are of low socioeconomic status. Few of the students are gifted, some are slow learners, and the majority of students are African American in regular education. Colored paper was introduced as a medium to see if scores would increase on reading comprehension and vocabulary assessments with this kind of student population. The use of colored paper to increase reading comprehension and vocabulary may depend upon the nature and nurture of the learner.

The type of assessments chosen utilized different aspects of cognitive knowledge. Multiple choice, true/false, short essay, context clues, sentence writing, definition usage and word application were chosen in order to completely assess the individual abilities of all learners. Colored paper assessments were implemented to determine if its use enhanced the students' ability to comprehend and to retain vocabulary knowledge and its application on assessments.

Research shows using colored paper increases the ability to read information, especially for certain populations of people. This study was carried out utilizing colored paper assessments for the purpose of increasing reading comprehension and vocabulary grades of individual learners.

## CHAPTER IV

### RESULTS

#### Overview

The purpose of this study was to determine if using black text on colored background would increase reading comprehension and vocabulary scores as compared to the use of black text on white background. This study was conducted over a one month period and involved all fourth graders at Cannon Street Elementary School, in Troup County, Georgia, during the 2006-2007 school year. Student scores were compared using goldenrod, blue, green, and white paper to see which color provided higher test scores. The following research questions were addressed:

1. What, if any, are differences in scores between students who took their reading tests on goldenrod, Astrobright blue, or green colored paper as compared to tests taken on white paper?
2. What, if any, are the differences between the reading scores of regular education students, gifted students, students with academic difficulty, special education students and students with speech difficulties who took their tests on colored paper as compared to tests on white paper?

This study applied the use of goldenrod, blue, and green colored paper for the purpose of increasing reading comprehension and vocabulary on assessments with fourth grade students at Cannon Street Elementary in Troup County, Georgia. The fourth grade



student body was comprised of fifty-one students which included twenty-two females and twenty-nine males: sixteen African American females, twenty-one African American males, four white females, eight white males, one American Indian/Alaskan female, and one interracial female.

Cannon Street Elementary had two fourth grade classes for the 2006-2007 school year. Class A was comprised of twenty-six students. Two of the twenty-six students were gifted. Two students were in speech. One student was in the student support team (SST) process and was diagnosed academically delayed. The other twenty-one students were regular education students. Class B contained twenty-five students. One student was gifted. Three students were in the SST process and were diagnosed with learning problems, behavior issues and/or learning disabilities. The other twenty-one students were regular education students.

#### Instrumentation

Weekly tests were given in comprehension and vocabulary for a month's period of time. All tests contained the same format. The comprehension tests were divided into sections that included six multiple choice, four true/false, and five short essay questions. Multiple choice questions included one correct answer, two incorrect answers and one stated as none of the above. Students were asked on the true/false section to correct any false statement by rewording the incorrect statement to make that statement true. The short essay section was to be answered using complete sentences (see Appendix D).

Each weekly vocabulary test was designed using a fill in the blank format in which the student placed the appropriate vocabulary word in the ten sentences provided. The sentences were designed specifically with the definition of the word in mind and a

clear understanding of which word would fit in the blank as matched to the meaning of the text (see Appendix E).

Students were given a different colored test each week on four different colors of paper: goldenrod, Astrobright blue, green, and white. Students were familiar with the testing format. A discussion introducing the tests on colored paper took place prior to giving the first test. Students were told they were going to be given the same tests on different colors and all students would receive all colors within a month's period of time.

The assessment data was entered into a Microsoft Excel spreadsheet and grades were recorded weekly. At the end of the four week period, data was entered into an SPSS program for data interpretation. The scores were compared to see if paper color influenced reading comprehension and vocabulary scores.

### Results

A 4 (color: white, goldenrod, green, and Astrobright blue) x 4 (time) ANOVA repeated measures statistical analysis was conducted to determine whether there were statistically significant differences in student comprehension and vocabulary assessment scores using different colored paper. ANOVA was set at .05.

The results suggest no significant main effect for colored paper with regard to comprehension ( $F = .24, p = .86$ , observe power analysis = .10), nor with regard to vocabulary ( $F = .14, p = .93$ , observe power analysis = .08) between color and scores. There was no interaction effect (color x time) for comprehension or vocabulary. There was no main effect for color, but there was a main effect for time. Comprehension showed statistical significance, but failed to adhere practical significance (eta squared = 0.04), (see Table 1).

Table 1

*Colored Paper Assessment Data on Comprehension and Vocabulary for All Trials*

Tests of Between-Subjects Effects									
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Corrected Model	Comprehension Score	2731.708 <sup>b</sup>	15	182.114	1.352	.176	.101	20.283	.804
	Vocabulary Score	9474.319 <sup>c</sup>	15	631.621	.873	.595	.068	13.098	.563
Intercept	Comprehension Score	1507090.479	1	1507090.479	11190.444	.000	.984	11190.444	1.000
	Vocabulary Score	1128616.743	1	1128616.743	1560.291	.000	.897	1560.291	1.000
Color	Comprehension Score	99.215	3	33.072	.246	.864	.004	.737	.096
	Vocabulary Score	317.220	3	105.740	.146	.932	.002	.439	.076
Order	Comprehension Score	1118.541	3	372.847	2.768	.043	.044	8.305	.662
	Vocabulary Score	3873.561	3	1291.187	1.785	.152	.029	5.355	.460
Color * Order	Comprehension Score	1446.685	9	160.743	1.194	.302	.056	10.742	.577
	Vocabulary Score	4842.703	9	538.078	.744	.668	.036	6.695	.362
Error	Comprehension Score	24241.781	180	134.677					
	Vocabulary Score	130200.681	180	723.337					
Total	Comprehension Score	1546558.000	196						
	Vocabulary Score	1273900.000	196						
Corrected Total	Comprehension Score	26973.490	195						
	Vocabulary Score	139675.000	195						

<sup>a</sup>. Computed using alpha = .05

<sup>b</sup>. R Squared = .101 (Adjusted R Squared = .026)

<sup>c</sup>. R Squared = .068 (Adjusted R Squared = -.010)

Results showed regardless of paper color or trial, gifted students ( $M = 98.33$ ) achieved a greater score on comprehension assessments with every trial, followed by regular students ( $M = 88.24$ ) and then SST, speech, and LD students ( $M = 82.13$ ). Gifted students ( $M = 98.33$ ) achieved greater scores on vocabulary assessments regardless of paper color or trial than regular students ( $M = 75.73$ ), and SST, speech, and LD students ( $M = 68.33$ ), (see Table 2).

Table 2

*Colored Paper Assessment Data of Student Classification of Scores for All Trials*

**2. Student Classification**

Dependent Variable	Student Classification	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Comprehension Score	gifted	98.333	3.548	91.333	105.334
	regular	88.235	.914	86.433	90.038
	SST, speech, LD	82.125	2.366	77.458	86.792
Vocabulary Score	gifted	98.333	8.197	82.162	114.505
	regular	75.731	2.110	71.567	79.894
	SST, speech, LD	68.333	5.464	57.552	79.114

Further results showed there was a main effect for order in this study ( $F = 2.76$ ,  $p = 0.04$ ), (see Table 1). All students took four tests, one each week on four different colors. Regardless of paper color, students performed best with comprehension on the fourth trial (see Tables 3 – 6); trial one ( $87.27 \pm 12.10$ ), trial two ( $86.04 \pm 13.20$ ), trial three ( $86.57 \pm 11.60$ ), and trial four ( $92.16 \pm 9.16$ ).

Table 3

*Colored Paper Assessment Descriptive Statistics Trial One*

*Descriptive Statistics					
	Student Classification	Paper Color	Mean	Std. Deviation	N
Comprehension	Regular	White	87.92	11.064	13
		Blue	87.50	9.846	10
		Green	83.88	11.307	8
		Yellow	90.27	6.784	11
		Total	87.67	9.737	42
	Total	White	84.50	16.644	14
		Blue	89.58	10.149	12
		Green	84.00	11.871	12
		Yellow	91.15	6.669	13
		Total	87.27	12.095	51
Vocabulary	Regular	White	86.15	23.993	13
		Blue	79.00	20.790	10
		Green	76.25	30.208	8
		Yellow	89.09	17.003	11
		Total	83.33	22.703	42
	Total	White	81.43	29.051	14
		Blue	82.50	20.505	12
		Green	75.00	28.762	12
		Yellow	88.46	16.756	13
		Total	81.96	24.168	51

\*Note: Cells with less than five participants were excluded from the Table due to lack of representation.

Table 4

*Colored Paper Assessment Descriptive Statistics Trial Two*

*Descriptive Statistics					
	Student Classification	Paper Color	Mean	Std. Deviation	N
Comprehension	Regular	White	85.78	10.721	9
		Blue	85.58	14.860	12
		Green	87.36	9.447	11
		Yellow	89.43	10.722	7
		Total	86.82	11.482	39
	Total	White	87.18	10.206	11
		Blue	82.38	18.315	13
		Green	89.31	9.844	13
		Yellow	85.36	12.754	11
		Total	86.04	13.199	48
Vocabulary	Regular	White	86.67	18.028	9
		Blue	75.00	29.388	12
		Green	81.82	18.878	11
		Yellow	74.29	27.603	7
		Total	79.49	23.614	39
	Total	White	86.36	17.477	11
		Blue	72.31	29.764	13
		Green	83.08	17.974	13
		Yellow	75.45	32.669	11
		Total	79.17	25.166	48

\*Note: Cells with less than five participants were excluded from the Table due to lack of representation.

Table 5

*Colored Paper Assessment Descriptive Statistics Trial Three*

*Descriptive Statistics					
	Student Classification	Paper Color	Mean	Std. Deviation	N
Comprehension	Regular	White	86.14	9.873	7
		Blue	88.67	10.259	9
		Green	85.15	11.753	13
		Yellow	86.90	5.626	10
		Total	86.59	9.511	39
	Total	White	87.82	9.196	11
		Blue	89.70	10.209	10
		Green	81.93	16.527	14
		Yellow	88.25	6.047	12
		Total	86.57	11.598	47
Vocabulary	Regular	White	65.71	29.358	7
		Blue	80.00	18.028	9
		Green	73.85	28.148	13
		Yellow	65.00	35.978	10
		Total	71.54	28.241	39
	Total	White	71.82	30.925	11
		Blue	79.00	17.288	10
		Green	68.57	33.480	14
		Yellow	70.83	35.280	14
		Total	72.13	29.923	47

\*Note: Cells with less than five participants were excluded from the Table due to lack of representation.

Table 6

*Colored Paper Assessment Descriptive Statistics Trial Four*

*Descriptive Statistics					
	Student Classification	Paper Color	Mean	Std. Deviation	N
Comprehension	Regular	White	94.64	6.903	11
		Blue	88.13	12.287	8
		Green	92.56	8.248	9
		Yellow	91.00	10.870	13
		Total	91.76	9.625	41
	Total	White	95.38	6.564	13
		Blue	89.25	10.855	12
		Green	93.36	7.646	11
		Yellow	90.71	10.499	14
		Total	92.16	9.161	50
Vocabulary	Regular	White	65.45	29.787	11
		Blue	71.25	21.671	8
		Green	75.56	31.269	9
		Yellow	63.85	25.344	13
		Total	68.29	26.730	41
	Total	White	70.77	30.128	13
		Blue	74.17	23.143	12
		Green	78.18	28.920	11
		Yellow	62.14	25.170	14
		Total	70.80	26.790	50

\*Note: Cells with less than five participants were excluded from the Table due to lack of representation.



Results also showed regardless of paper color or trial, females ( $M = 91.4$ ) achieved greater scores on comprehension assessments than males ( $M = 84.4$ ). Females outperformed males (see Table 7).

Table 7

*Gender Scores*

1. Gender					
Dependent Variable	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Comprehension Score	Female	91.488	1.132	89.255	93.721
	Male	84.405	1.167	82.103	86.706
Vocabulary Score	Female	78.852	2.684	73.557	84.148
	Male	73.219	2.767	67.761	78.678

Continued findings with regard to specialty groups revealed regardless of paper color or trial, non-minorities ( $M = 88.99$ ) achieved greater scores on vocabulary assessments than minorities ( $M = 71.5$ ), (see Table 8).

Table 8

*Minority Classification of Scores*

2. Minority Classification					
Dependent Variable	Minority Classification	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Comprehension Score	no	90.673	1.647	87.424	93.922
	yes	87.132	.977	85.205	89.058
Vocabulary Score	no	88.926	3.650	81.726	96.127
	yes	71.592	2.164	67.323	75.861

## CHAPTER V

### SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

#### Overview

This study examined fourth grade assessments on different colored paper for the purpose of increasing reading comprehension and vocabulary recognition. The purpose of this study was to determine if using black text on colored background would increase reading comprehension and vocabulary scores as compared to the use of black text on white background. This study was conducted over a one month period and involved all fourth graders at Cannon Street Elementary School, in Troup County, Georgia, during the 2006-2007 school year. Student scores were compared using goldenrod, Astrobright blue, green, and white paper to see which color provided higher test scores. The following research questions were addressed:

1. What, if any, are differences in scores between students who took their reading tests on goldenrod, Astrobright blue, or green colored paper as compared to tests taken on white paper?
2. What, if any, are the differences between the reading scores of regular education students, gifted students, students with academic difficulty, special education students and students with speech difficulties who took their tests on colored paper as compared to tests on white paper?

## Summary

Cannon Street Elementary had two fourth grade classes for the 2006-2007 school year. Class A was comprised of twenty-six students. Class B contained twenty-five students. Of the fifty-one fourth grade students, twenty-two were female and twenty-nine were male: sixteen African American females, twenty-one African American males, four white females, eight white males, one American Indian/Alaskan female, and one interracial female.

The subgroups included regular education students, students with academic difficulty included in the student support team process, and gifted students. In class A, two of the twenty-six students were gifted. Two students were in speech. One student was in the student support team (SST) process and was diagnosed academically delayed. The other twenty-one students were regular education students. In class B, one student was gifted. Three students were in the SST process and were diagnosed with learning problems, behavior issues and/or learning disabilities. The other twenty-one students were regular education students.

Fifty-one fourth grade students at Cannon Street Elementary read Burch's (1980) chapter book *Ida Early Comes Over the Mountain* and took comprehension and vocabulary assessments given every Friday over four chapters read during the week. Four comprehension and four vocabulary assessments were given on different colored paper over a month's period of time. Goldenrod, Astrobright blue, green, and white paper were used for all assessments. Scores were compared within colors and subgroups using SPSS to see if colored paper would increase reading comprehension and

vocabulary recognition. Colored paper did not increase comprehension or vocabulary scores (see Table 1).

### Conclusions

The results of this study showed no significant differences in the comprehension and vocabulary achievement scores of those who took tests on colored paper versus those who took tests on white paper. Similar results were reported in a study by Skinner (2004) within a college exam environment utilizing only one trial assessment, and in a study by Johnston (1984) who utilized blue colored paper and white paper for the testing of secondary vocational agriculture teachers to see which color had higher readability. Both Skinner (2004) and Johnston (1984) concluded no significant differences utilizing color for assessment purposes.

Results did show gifted students achieving higher scores on comprehension and vocabulary assessments regardless of paper color as compared to regular education students, students in speech, or students who had academic difficulty (SST). These results correspond with a study by Hafner (1991) who stated “vocabulary correlates the highest with total intelligence” (p. 11) according to the WISC-R test given to this study’s students.

Other secondary results became evident upon data analysis of the present study. Females performed better than males on comprehension tests. Non-minority students achieved higher scores on vocabulary assessments than minority students. These outcomes support the research done by Slocumb (2004) as low socioeconomic boys lag behind in language development from their peers. In a study by Berninger, Abbott, Vermeulen, and Fulton (2006), they found individual differences and weaknesses in oral

vocabulary interfered with the development of either word reading or reading comprehension. Reading comprehension was not as high for those with vocabulary deficits, corresponding with the results of this study.

Comprehension assessment scores were higher on the fourth test trial than on any other trial test. All tests contained the same format and design. Students prepared for the tests by practicing in the same way as in previous weeks such as making vocabulary practice cards and playing a type of concentration game using the cards, answering comprehension questions, reading the text orally and discussing the chapters. Scoring higher on the fourth test trial could be the result of excitement at completing the book and interest in the material from the final chapters or it could be related to increasing scores as they became comfortable with the type of assessment; practice makes perfect.

#### Recommendations

Individuals perceive color differently. According to Irlen (1991) optimal color is individualistic. More thought and time as well as resources should be put into finding each student's optimal color and the use of that color with regard to assessments may impact each individual student's achievement score. More research is needed utilizing each individual student's optimal color for assessments.

A study by Lobello, Wolfe, Gulgoz, and Doleys (1998) concluded future research was needed with regard to phonological processing. Their study showed discrimination in phonological processing between the normal readers and those with reading difficulties. They stated the use of various colored backgrounds on a computer screen may have made a difference in the results of such study. They suggested using

background color contrasts in all forms of print media for the benefit of all types of readers.

Cunningham and Stanovich (1997) found early print exposure facilitates the development of processes and knowledge bases such as vocabulary and familiarity of complex syntactic structures leading to increased reading comprehension abilities. Berninger et al. (2006) suggest instructional focus on vocabulary development, knowledge of the alphabetic principle, and the accuracy and rate of phonological decoding, real-word reading and text reading for the purpose of increasing reading comprehension. According to Irlen (1991) finding optimum color correspondence with individual students and utilizing colored overlays or colored lenses in glasses while reading and learning increases reading comprehension. It may be possible to utilize color as in overlays, colored lenses, or colored paper to initiate fluency and comprehension while teaching phonological decoding, text reading, and vocabulary development. More research is needed to support the concept of utilizing individual optimum color and fluency checks in early print exposure.

What is taught from birth on may be different from person to person and culture to culture. There are too many variables with regard to vision and color such as parental involvement and print exposure, vocabulary development, phonemic awareness, phonological awareness, fluency, behavior, intelligence, visual acuity, light sensitivity, eye physiology of rods and cones, individual reading capabilities, and color perception to utilize one basic color or few colors as a cure all for increasing reading comprehension and fluency for all subgroups: gifted, regular education, and speech, learning disabled,

and those with academic difficulty (SST). I recommend this study be replicated using a specific subgroup of students.

This research was designed to minimize Type 1 errors and was conservative in nature. The sample sizes of the individualized subgroups such as gifted, regular and specials were obviously too small for meaningful analyses of such subgroups. This study should be replicated using a larger pool of learners in order to provide sufficient sample size for reasonable inferences to be made.

### Implications

Students, parents, teachers, and administrators, while recognizing colored paper as a method for catching the eye of the reader, may not be aware of the physical understanding of how the eye sees color, nor how optimal paper color may allow the reader's eyes to better focus on the print especially for those with SSS or a reading disability (Irlen, 1991). The results of this study showed utilizing colored paper for assessments did not increase comprehension or vocabulary. Finding individual optimal color may be an avenue used to help find the key to accelerate learning.

Parents are usually the first to notice how their child learns. They have provided the background or schema in which to facilitate learning taking place as their child progresses through school. They are usually the first to recognize if there is a problem or an acceleration in their child's learning. Parents want their children to succeed but sometimes medical issues get in the way of learning such as attention deficit disorders, hyperactivity, or vision problems. Health professionals such as doctors, psychologists, psychiatrists, ophthalmologists, or optometrists may help to diagnose and treat medical issues that may interfere with learning. There are screenings that can help to locate any

physiological eye problems as well as finding optimal color for each individual. Parents should look into ways to help their child be successful in school and be more active in this process.

Educators are aware of how a child learns. During a school year they implement several strategies to initiate learning. Many use colored paper as an eye catcher for print on paper without knowing how the eye perceives color. It would be beneficial for educators to be informed about color with regard to the human brain. Some assessments such as the Iowa Test of Basic Skills (ITBS) utilize color on some of their pages. Educators should be informed as to the results of utilizing color to facilitate learning.

Administrators play an important part in the learning of children. They decide what programs should be implemented in their school(s) within a school year. They also provide the money to purchase materials such as paper and overlays. Providing colored paper and colored overlays may present an opportunity for more research and interest in propelling the learning of children utilizing color within teaching and learning strategies.

Employees responsible for curriculum implementation should be aware of how color and light affects learning (Heschong Mahone Group, 2003). Special care should be given to how environment stimulates student interest and learner's needs (Rayneri, 2006). Color may be used to initiate high interest and promote learning whether it's on the walls, paper, or materials. Information about color should be shared and discussed to maximize learning opportunities for students.



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## APPENDICES

## APPENDIX A

### PARTICIPANT INFORMATION LETTER

# Auburn University

Auburn University, Alabama 36849-5221

Educational Foundations  
Leadership and Technology  
4036 Haley Center

Telephone: (334) 844-4460  
FAX: (334) 844-3072

#### **INFORMATION SHEET for a Research Study Entitled Colored Paper Assessments**

You are invited to participate in a research study involving the use of colored paper for assessment purposes. This study is being conducted by Mrs. Sue Duggan, under the supervision of Dr. James Witte of Auburn University and Mrs. Candace McGhee, Principal of Cannon Street Elementary. We hope to learn if the use of colored paper for testing purposes increases your child's ability to read and understand the written language. Your child was selected as a possible participant because he/she is in the fourth grade at Cannon Street Elementary.

If you decide to participate, I will give multiple reading and/or writing assessments either on colored paper or white paper. The assessments will be graded and returned to the student who will take home these papers in their signed papers folder each week on Tuesday. Grades will be taken and recorded throughout the academic school year. All grades will be kept confidential.

The only risk I can foresee would be the use of colored paper may increase your child's ability to read and understand what is written. Colored paper assessments may produce higher grades due to the easier readability and understanding of print on colored paper. If colored paper increases the ability to read and understand the written language, then possibly text books, reading books, assessments, and other types of reading materials may be reproduced onto colored paper for the benefit of all readers. Your child may not benefit from colored paper assessments this year. But, pending the results of the data during the spring of 2007, colored paper may be implemented for reading and writing uses in the future.

Any information obtained in connection with this study and that can be identified with your child will remain confidential. Your child will be assigned a number. This number will be used to identify the grade your child received on an assessment. Your child's name will never be used in connection with this study, only their assigned number. Information collected through your child's participation may be used to fulfill an educational requirement such as in a dissertation about colored paper assessments, published in a professional journal, and/or presented at a professional meeting, etc. If so, none of your identifiable information, such as your child's name will be included.

Page 1 of 2

A LAND-GRANT UNIVERSITY

Your child's information will be protected and all identifying data, such as your child's name and assessment grade will be destroyed at the end of the school year. You may have your child withdrawn from participation at any time, without penalty, and any data which has been collected about your child will be withdrawn providing you provide written proof that your child will not participate further. All assessments will take place within your child's classroom. All assessments are the same as what all other fourth grade students are receiving, the only difference is that your child will receive their assessments on different colors of paper.

Your decision whether or not to participate will not jeopardize your future relations with Auburn University or Troup County Schools.

If you have any questions we invite you to ask them now. If you have questions later, Mrs. Sue Duggan, Cannon Street Elementary, 706-883-1540, and Dr. James Witte, Auburn University, 334-884-3054, will be happy to answer them. You will be provided a copy of this form to keep.

For more information regarding your rights as a research participant you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone 334-844-5966 or e-mail at [hsubject@auburn.edu](mailto:hsubject@auburn.edu) or [IRBChair@auburn.edu](mailto:IRBChair@auburn.edu).

**HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.**

Mrs. Sue Duggan 10-30-06  
Investigator's signature Date

Candace McHree 10-30-06  
Principal's signature Date

## APPENDIX B

### PARTICIPANT INFORMED CONSENT

# Auburn University

Auburn University, Alabama 36849-5221

Educational Foundations  
Leadership and Technology  
4036 Haley Center

Telephone: (334) 844-4460  
FAX: (334) 844-3072

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If you decide to participate, I will give multiple reading and/or writing assessments either on colored paper or white paper. The assessments will be graded and returned to the student who will take home these papers in their signed papers folder each week on Tuesday. Grades will be taken and recorded throughout the academic school year. All grades will be kept confidential.

The only risk I can foresee would be the use of colored paper may increase your child's ability to read and understand what is written. Colored paper assessments may produce higher grades due to the easier readability and understanding of print on colored paper. If colored paper increases the ability to read and understand the written language, then possibly text books, reading books, assessments, and other types of reading materials may be reproduced onto colored paper for the benefit of all readers. Your child may not benefit from colored paper assessments this year. But, pending the results of the data during the spring of 2007, colored paper may be implemented for reading and writing uses in the future.

Any information obtained in connection with this study and that can be identified with your child will remain confidential. Your child will be assigned a number. This number will be used to identify the grade your child received on an assessment. Your child's name will never be used in connection with this study, only their assigned number. Information collected through your child's participation may be used to fulfill an educational requirement such as in a dissertation about colored paper assessments, published in a professional journal, and/or presented at a professional meeting, etc. If so, none of your identifiable information, such as your child's name will be included.

\_\_\_\_\_  
Participant's Initials

Page 1 of 2

Your child's information will be protected and all identifying data, such as your child's name and assessment grade will be destroyed at the end of the school year. You may have your child withdrawn from participation at any time, without penalty, and any data which has been collected about your child will be withdrawn providing you provide written proof that your child will not participate further. All assessments will take place within your child's classroom. All assessments are the same as what all other fourth grade students are receiving, the only difference is that your child will receive their assessments on different colors of paper.

Your decision whether or not to participate will not jeopardize your future relations with Auburn University or Troup County Schools.

If you have any questions we invite you to ask them now. If you have questions later, Mrs. Sue Duggan, Cannon Street Elementary, 706-883-1540, and Dr. James Witte, Auburn University, 334-884-3054, will be happy to answer them. You will be provided a copy of this form to keep.

For more information regarding your rights as a research participant you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone 334-844-5966 or e-mail at [hsubjec@auburn.edu](mailto:hsubjec@auburn.edu) or [IRBChair@auburn.edu](mailto:IRBChair@auburn.edu).

**HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.**

Participant's signature	Date	<u><i>Mrs. Sue Duggan</i></u>	<u><i>10-30-06</i></u>
		Investigator obtaining consent	Date
Print Name		<u><i>Sue Duggan</i></u>	
		Print Name	

Parent's or Guardian Signature	Date
Print Name	

<u><i>Candace McGhee</i></u>	<u><i>10-30-06</i></u>
Principal's signature	Date
<u><i>Candace McGhee</i></u>	<u><i>10-30-06</i></u>
Print Name	

APPENDIX C  
INSTITUTIONAL REVIEW BOARD

Auburn University

Auburn University, Alabama 36849



Office of Human Subjects Research  
307 Samford Hall

Telephone: 334-844-5966  
Fax: 334-844-4391  
hsubjec@auburn.edu

September 29, 2006

MEMORANDUM TO: Mauna Sue Duggan  
~~ADFP~~

PROTOCOL TITLE: "Colored Paper Assessments"

IRB AUTHORIZATION NO.: 05-178 EP 0509

APPROVAL DATE: September 21, 2005  
RENEWAL DATE: September 28, 2006  
EXPIRATION DATE: September 20, 2007

*file*

The renewal for the above referenced protocol was approved by IRB Expedited procedure under Expedited Category #7 on September 28, 2006. You should report to the IRB any proposed changes in the protocol or procedures and any unanticipated problems involving risk to subjects or others. Please reference the above authorization number in any future correspondence regarding this project.

If you will be unable to file a Final Report on your project before September 20, 2007, you must submit a request for an extension of approval to the IRB no later than September 10, 2007. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to September 20, 2007, you must suspend the project immediately and contact the Office of Human Subjects Research for assistance.

A Final Report will be required to close your IRB project file. You are reminded that consent forms must be retained at least three years after completion of your study.

If you have any questions concerning this Board action, please contact the Office of Human Subjects Research at 844-5966.

Sincerely,

Handwritten signature of Peter W. Grandjean.

Peter W. Grandjean, Chair  
Institutional Review Board for the Use of Human  
Subjects in Research

cc: Dr. Jose' Llanes  
Dr. James Witte



APPENDIX D

COMPREHENSION ASSESSMENT SAMPLE

Ida Early Comes Over the Mountain

Comprehension Test  
Week 4

Name: \_\_\_\_\_

Multiple Choice. Circle the letter beside the correct answer.

1. Which Sunday in September did the family have visitors?
  - a. Third
  - b. Fourth
  - c. Fifth
  - d. None of the above
  
2. How old was Aunt Myrtle and Uncle Ross's child?
  - a. Two
  - b. Eight
  - c. Fifteen
  - d. None of the above
  
3. Where did Ellen get her dress?
  - a. At the dime store
  - b. Her Aunt gave it to her
  - c. She made it
  - d. None of the above
  
4. What items did Ida wear on her clothing only on Sundays?
  - a. Her overalls and flowers
  - b. A Sunday dress and flowers
  - c. Shorts, a blouse and flowers
  - d. None of the above
  
5. What kind of pie was Ida cooking?
  - a. Pecan pie
  - b. Lemon pie
  - c. Sweet potato and raisin pie
  - d. None of the above
  
6. Why did Ellen go back to church?
  - a. Her Sunday school class was having a party
  - b. Her Sunday school class was practicing for a program
  - c. Her Sunday school class was going to visit someone sick
  - d. None of the above

True/ False (Correct the False) Give the correct answer if false.

1. \_\_\_\_\_ Aunt Myrtle wanted Ida to wash dishes after lunch.
2. \_\_\_\_\_ Kathy Alice said that Ida was "tacky-looking."
3. \_\_\_\_\_ The twins hid under their beds on the second day of school.
4. \_\_\_\_\_ The twins told Ida to wear a "blown suit."

Discussion Questions. Please answer the questions with complete sentences.

5. Compare how you would handle a situation if someone made fun of you to how Ida handled the schoolyard scene.

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6. Do you think Clay and Dewey will be "model students"? Why or why not?

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7. How do you suppose Randall and Eilen feel about the way Ida was treated in the schoolyard? Have you ever made fun of someone?

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8. Why do you think the look on Ida's face in the schoolyard lasted, and she did not laugh it off as usual?

---

---

9. What would you think Randall and Eilen would do if they could go back and begin the day over? Give examples.

---

---

APPENDIX E

VOCABULARY ASSESSMENT EXAMPLE

Spelling \_\_\_\_\_

Vocabulary \_\_\_\_\_

Ida Early Comes Over the Mountain

Spelling and Vocabulary Test  
Week 4

Write the dictation sentences below.

1. \_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_

Multiple Choice. Circle the correct spelling.

- a. swate
- b. swat
- c. suate
- d. none of the above

- a. refused
- b. refused
- c. refuesed
- d. none of the above

- a. giarring
- b. giaring
- c. gaining
- d. none of the above

- a. pebble
- b. pebie
- c. pebbeil
- d. none of the above

- a. clurch
- b. clutch
- c. clerch
- d. none of the above

- a. seidum
- b. soidem
- c. seidom
- d. none of the above

- a. cowerdiy
- b. cowardley
- c. cowardiy
- d. none of the above

- a. shurbery
- b. shrubbery
- c. shurbbary
- d. none of the above

11.	12.
13.	14.
15.	16.
17.	18.
19.	20.

Fill in the blank with the correct word in the sentences below.

1. The twins became the \_\_\_\_\_ after winning the game.
2. Kathy Alice thought that Ida's clothes looked \_\_\_\_\_.
3. Ida accepted Noon's \_\_\_\_\_ to join him in the contest.
4. Dewey \_\_\_\_\_ the sand around his foot to make a frog house.
5. The flower on Ida's overalls looked like a \_\_\_\_\_ feather duster.
6. The other children on the playground \_\_\_\_\_ at Ida.
7. In Mr. Sutton's \_\_\_\_\_ Ida took good care of their home.
8. Kathy Alice was \_\_\_\_\_ size for an eight year old.
9. They were all ready for church and wearing their Sunday \_\_\_\_\_.
10. The \_\_\_\_\_ flower looked as if it were real.