HOW DOES EXTRANEOUS TEXTBOOK MATERIAL INFLUENCE THE READING COMPREHENSION OF NORMAL AND IMPAIRED COLLEGE STUDENTS?

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TABLE OF CONTENTS

ABSTRACT vii

ACKNOWLEDGMENTS ix

DEDICATION x

LIST OF TABLES xi

LIST OF FIGURES xii

INTRODUCTION 1

Cognitive Psychology and Reading Comprehension 2

Background Information from Cognitive Psychology 2

Attention 2

Short-term Memory 3

Working Memory 4

Implications for the Effects of Extraneous Material 5

Reading Comprehension 5

Prerequisites to Reading Comprehension 6

Metacognition and Executive Control 7

Component Skills of Reading Comprehension 9

Sources of Individual Differences in Reading Comprehension 9

The Role of Interest in Learning 12

The Theory of Selective Attention 14

Methods of Instruction and Student Learning 19

General Principles of Learning and Instruction 19

Student Strategies 19

Teaching Strategies 20
Evaluation of Current Textbooks in the United States 23
Evolution of Psychology Textbooks in the United States 24
The Role of Text in Classroom Learning 25
Text Presentation and Organization 27
Text Presentation 27
Text Organization 28
Seductive Details 28
Positive Findings Regarding Seductive Details 29
Criticisms and Negative Findings 41
Boxed Material: Seductive Detail, Apparently Irrelevant Facts, or Regular Text? 42
Attention Deficit-Hyperactivity Disorder 43
Characteristics and Symptoms 43
Causes and Physiological Correlates of ADHD 46
Executive Functioning Theories of ADHD 46
Right Parietal Lobe Theory 48
Dopamine Hypothesis 49
Overall Genetic Component of ADHD 50
A Unifying Theory of ADHD 50
Treatments 51
Stimulant Medications 51
Effects of Stimulant Medications 52

Learning and School-Based Deficits Resulting from ADHD 54
Learning Disabilities 55
Symptoms and Characteristics 56
Specific Learning Disorders and Resulting Learning and School-Based Deficits 57
Reading Disability 57
Mathematics Disorder 59
Disorder of Written Expression 61
Learning Disorder Not Otherwise Specified 63
Co-morbidity of ADHD and LD 63
Reading Comprehension, Reading Disabilities, and ADHD 64
ADHD and LD: Implications for a Seductive Details Effect 64
Definition of Seductive Details 65
Present Study 66
Predictions 66
Hypothesis I 66
Hypothesis II 66
Hypothesis III 66
Hypothesis IV 67
Uncertain Predictions 67
METHOD 68
Design 68
Overview of Procedure 68

Participants 68
Materials 72
Survey Instruments 72
Informed Consent Form 72
Wender Utah Rating Scale 72
Beck Depression Inventory 73
Personal History Questionnaire 73
Experimental Materials 73
Text Passages 73
Reading Comprehension Quiz 74
Post-study Questionnaire 74
Evaluation Questionnaire 75
Procedure 75
Procedure for Conducting an Experimental Session 75
Selection of Final Experimental Sample 76
Use of the WURS 76
Use of BDI and Post-study Questionnaire 78
Statistical Analysis 83
RESULTS 85
ANOVA Results 85
Questionnaire Data 94
Initial Pool of 130 Participants 94
Final Experimental Sample of 39 Participants 108

SUMMARY AND DISCUSSION 140
Summary 140
Hypothesis I 141
Hypothesis II 141
Hypothesis III 141
Hypothesis IV 141
Questionnaire Findings 142
Initial Pool of 130 Participants 142
Final Experimental Sample 142
Discussion 143
Specific Limitations of the Present Experiment 145
Suggestions for Future Research 145
LITERATURE CITED 147
APPENDIX 160

ABSTRACT

Seductive details are interesting but irrelevant details added to a passage to make it more interesting, and research indicates that such details impair learning and recall of information. Seductive details have traditionally included illustrations, facts, names, and examples, but the effects of boxed material in textbooks have yet to be studied. If seductive details impede normal readers, they may have particularly adverse affects on students with serious reading problems, such as those with learning disabilities (LD) or attention deficit hyperactivity disorder (ADHD). The present study examined the effects of boxed material on recall for both "Normal Control" (NC) and "Attentional Deficit" (AD) participants, who each read one of two versions of a text passage entitled "People with Severe and Multiple Disabilities." The "Original Text" (OT) version contained extraneous information and illustrations, set apart from the rest of the text, as they appear in the textbook Human Exceptionality: Society, School, and Family (Hardman, Drew, & Egan, 1999). The "Modified Text" (MT) version presented this information imbedded in the text and illustrations and "Focus" questions from the margins were eliminated. The Wender Utah Rating Scale, the Beck Depression Inventory, and a Personal History Questionnaire were administered, and students completed a 45-question multiple choice quiz on the passage material and a series of post-study questions. Results indicate that all readers performed significantly better on text information (TI) questions than on boxed information (BI) questions. Clearly contrary to prediction, however, AD participants performed better, on average, than did NC participants, with the effect nearly reaching significance. In addition, questionnaire data indicated that NC and AD participants did not rate significantly differently on either passage clarity or content; AD participants

generally find information presented inside boxes in textbooks to be significantly more helpful than do NC participants; and AD participants read the preface and/or "Information for Students" at the beginning of a textbook significantly less often than do NC participants.

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LIST OF TABLES

1. DSM-IV-TR Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder .. 44
2. DSM-IV-TR Criteria for Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified 45
3. Expected Effects of Stimulant Medication for the Treatment of ADHD 53
4. DSM-IV-TR Diagnostic Criteria for Reading Disorder 58
5. DSM-IV-TR Diagnostic Criteria for Mathematics Disorder 60
6. DMS-IV-TR Diagnostic Criteria for Disorder of Written Expression 62
7. Year in College Distribution 70
8. Gender Distribution 71
9. Distribution of NC and AD Participants in Final Experimental Sample 81
10. Diagnosis Distribution for Final Experimental Sample 82
11. Tests of Between and Within-Subjects Effects 86
12. Mean Percent Correct and Standard Deviations 89
13. Version (OT vs. MT): Mean Percent Correct and Standard Errors. 90
14. Group (NC vs. AD): Mean Percent Correct and Standard Errors 91
15. Version x Group: Mean Percent Correct and Standard Errors 92
16. Type of Recall Stem (BI vs. TI): Mean Percent Correct and Standard Errors 93
17. Questionnaire Data for Initial Pool of 130 Participants 97
18. Questionnaire Data for Final Experimental Sample of 39 Participants 113
19. Results of t-tests Comparing NC and AD Questionnaire Data 115

LIST OF FIGURES

1. Wender Utah Rating Scale Scores 77
2. Beck Depression Scale Scores 79
3. Percentage of Boxed Information Questions Answered Correctly 84
4. Mean Percent Correct Answers to Recall Questions for NC & AD in OT & MT Text Conditions 88
5. Did you read the information in the 2 boxes that were in the reading material? .. 95
6. Distribution of Scores for Initial Pool of 130 Participants: Please rate the frequency with which you read the information presented inside boxes in textbooks. 100
7. Distribution of Scores for Initial Pool of 130 Participants: Please rate the frequency with which you read the preface and/or "Information for Students" at the beginning of a textbook 102
8. Distribution of Scores for Initial Pool of 130 Participants: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first. 104
9. Distribution of Scores for Initial Pool of 130 Participants: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material. 106
10. NC Participants: Did you read the information in the 2 boxes that were in the reading material? 109
11. AD Participants: Did you read the information in the 2 boxes that were in the reading material? 110

12. NC Distribution of Scores for Final Experimental Sample: Please rate the clarity of the material you read in terms of content. 117
13. NC Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the information presented inside boxes in textbooks. 119
14. AD Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the information presented inside boxes in textbooks. 120
15. NC Distribution of Scores for Final Experimental Sample: Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material. 122
16. NC Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the preface and/or “Information for Students” at the beginning of a textbook..... 124
17. AD Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the preface and/or “Information for Students” at the beginning of a textbook..... 125
18. NC Distribution of Scores for Final Experimental Sample: If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first. 127
19. AD Distribution of Scores for Final Experimental Sample: If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first. 128

20. NC Distribution of Scores for Final Experimental Sample: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first. 130
21. AD Distribution of Scores for Final Experimental Sample: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first. 131
22. NC Distribution of Scores for Final Experimental Sample: If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them. 133
23. NC Distribution of Scores for Final Experimental Sample: If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them. 135
24. NC Distribution of Scores for Final Experimental Sample: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material. 137
25. AD Distribution of Scores for Final Experimental Sample: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material. 138

INTRODUCTION

In an attempt to make textbooks more interesting, many authors and publishers add interesting but extraneous material to regular text. Pictures, stories, boxed material set off from the text, and other pedagogical aids have increasingly characterized textbooks since the 1950s (See e.g., Weiten & Wight, 1992). However, such extraneous material may adversely affect students' ability to attend to, comprehend, and retain the more important text information. Extraneous material may, then, distract readers from their primary task of comprehending text. Some popular strategies used to create interest in textbooks "may not facilitate, indeed may even interfere with, the learning of important information" (Wade, 1992, p. 256). Indeed, some research suggests that such seductive details, "interesting but irrelevant details that are added to a passage to make it more interesting" (Harp & Mayer, 1997, p. 92), interfere with reading comprehension. In general, novel, active, concrete, and personally involving details are extremely memorable to readers, whereas abstract, general, and structurally important ideas are not (Garner, Brown, Sanders, & Menke, 1992). If seductive details impede normal readers, they may have particularly adverse import on students with serious problems in reading, such as those with learning disabilities (LD) or attention deficit hyperactivity disorder (ADHD).

The present research investigated the effect of seductive details on the reading comprehension of normal and impaired adult readers. As can be seen in the following literature review, both theoretical explanations of human memory and research findings on factors influencing reading comprehension suggest that extraneous details would indeed be seductive.

Cognitive Psychology and Reading Comprehension

The study of reading comprehension involves understanding the numerous components and processes that make up the overall act of reading and understanding text material. First, however, a cursory review of basic cognitive processes will be helpful.

Background Information from Cognitive Psychology

Although some aspects of the information processing approach to human cognition are no longer deemed valid, two of its tenets are still accepted by many cognitive psychologists (Guenther, 1998). The first is that mental processes such as language or reasoning can be understood as the collective actions of sets of elementary processes, such as placing information in short-term memory, searching information held in short-term memory, and activating information held in long-term memory (Guenther, 1998). The second is that human cognition, particularly short-term memory, has limited capacity for storing and transmitting information. These tenets, in addition to the following reviews of attention, short-term memory, and working memory, provide valuable insight into this study.

Attention

Research indicates that attention, and particularly the limited ability of humans to attend to information (Benjafield, 1997), plays an important role in both early and late stages of information processing (Solan, Shelley-Tremblay, Ficarra, Silverman, & Larson, 2003). Although numerous theories attempt to explain this situation, two such theories are of particular import to this study. According to the filter model of attention, information passes through three basic stages while being processed: 1) Analysis for gross physical attributes; 2) Analysis for their meaning; and 3) Placement of

interpretations of stimuli into permanent or long-term memory (LTM) (Guenther, 1998). Of importance is a theorized filter between the first and second stages that screens out a great deal of information before it is processed for meaning (Guenther, 1998). This filter helps us to process only information deemed important. In contrast to the filter model, the limited resource model holds that cognitive systems have only a limited amount of "energy" or "resources" for activating cognitive skills and stored knowledge (Guenther, 1998). Thus, the extent to which a cognitive system can be activated at any particular moment is limited (Benjafield, 1997; Guenther, 1998). In other words, we can only pay attention to so much at one time.

Taken together, these and other models of attention point not only to the limited capacity of attention, but also to the implication that the amount of unimportant information presented in textbooks should be reduced. For example, Chandler and Sweller (1991) demonstrated that certain types of learning materials impose unusually high levels of cognitive load on learners due to a split-attention effect. This effect, which has been shown to be a serious problem with certain types of instructional designs, occurs when learners split their attention between, as well as mentally integrate, multiple sources of information (Yeung, 1999).

Short-term Memory

The concept of short-term memory (STM) also deals with limitations on the amount of information that people can keep or use in their memory at any particular time (Guenther, 1998). Researchers originally theorized that if readers are required to process information that exceeds their limited STM capacity, then some material must be lost owing to cognitive overload (Sweller, 1993). In fact, research has shown that cognitive

load is an important factor in instructional design for areas of learning such as science (Chandler & Sweller, 1991) and geometry (Mousavi, Low, & Sweller, 1995).

STM was originally viewed as a "passive storage buffer," and prototypical STM models "assumed that short-term memory plays a crucial role in the performance of…cognitive tasks such as language comprehension, mental arithmetic, and reasoning" (Daneman & Hannon, 2001, p. 556). However, traditional STM measures, such as digit and word span tests, did not predict performance on complex cognitive tasks. As a result, the construct of working memory (WM) was proposed as an alternative to STM (Daneman & Hannon, 2001).

Working Memory

The "theory of short-term memory as a passive storage buffer was replaced by the theory of working memory as a dynamic system with processing and storage capabilities" (Daneman & Hannon, 2001, p. 209). WM supposedly acts as a buffer for the most recently read portions of a text passage and holds information retrieved from long-term memory (LTM) "to facilitate its integration with the currently active text" (Cain, Bryant, & Oakhill, 2004, p. 31).

Measures of WM "predict performance on cognitive activities as diverse as reading, listening, writing, solving verbal and spatial reasoning problems, and programming a computer" (Daneman & Hannon, 2001, p. 210). WM capacity has also been shown to be correlated with performance of college students on standardized assessments of comprehension (Cain et al., 2004). Furthermore, WM capacity is also related to skills necessary for comprehension, such as memory for facts, inference of unknown meaning from context, and resolution of pronouns (Cain et al., 2004). Findings

such as these indicate both that WM plays an important role in the performance of educationally relevant cognitive tasks and that individuals with large WM capacities perform better on such tasks than do those with smaller WM capacities (Daneman & Hannon, 2001).

Of particular import to the current study are recent studies indicating that children with ADHD have WM deficits (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). Unfortunately, "differences in the age range of participants, research designs, and working memory tasks … [have precluded] clear interpretations of these preliminary findings" (McInnes et al., 2003, p. 429).

Implications for the Effects of Extraneous Material

These and other findings on attention and STM/WM support the idea that reducing both the number of sources of information and the total amount of unimportant information presented in textbooks will result in better comprehension and retention of information. For example, eliminating boxed material, extraneous pictures, and unrelated tables and figures from textbooks would accomplish both of these goals. Such changes in the method of presenting information would allow readers to not only pay more attention to important information in the text, but to do so without having to filter through volumes of unimportant extraneous material, as well.

Reading Comprehension

Reading comprehension is a complicated process by which a person seeks to understand that which he or she is reading. It is often mediated by selective attention, familiarity with the subject at hand, learner reading expertise, working-memory capacity, and cognitive load (Yeung, 1999). In addition, "reading comprehension is highly

correlated with general intelligence and…both [reading comprehension and general intelligence] are related to school success" (Hannon & Daneman, 2001, p. 103). As a result, understanding the processes behind reading comprehension is important both to this study and to a person's success in school and in life.

Prerequisites to Reading Comprehension

Wagner and Sternberg (1987) identified two prerequisites to a person's ability to comprehend written prose. First, a person must have mastered the basic decoding skills used to attach meaning to written symbols such as letters, numbers, and words. Without proper decoding skills these symbols will remain a mystery to the reader. Second, the person must also have access to relevant "world knowledge" in order to be able to interpret and evaluate the information presented in a meaningful manner. This knowledge is necessary because people read, understand, and remember material that they can relate to prior knowledge in a very different manner than they do material that is not related to anything that they have learned previously (Wagner & Sternberg, 1987). Although Wagner and Sternberg (1987) assert that these prerequisites suffice for rudimentary reading comprehension, they also state that additional abilities, such as flexibility of reading across variations in reading purpose and text difficulty, add to a person's reading comprehension abilities. They further claim that truly skilled comprehension of written material also requires "the ability to determine how and where to apply one's reading resources in order to maximally reach one's comprehension goals in a given situation" (Wagoner & Sternberg, 1987, p. 1). They assert that this last requirement for skilled comprehension is an important aspect of a person's "executive control" of reading and reading comprehension.

Metacognition and Executive Control

Research on metacognition and executive control has increased understanding of the processes involved in reading and reading comprehension (Garner, 1987). Specifically, the concept of metacognition provides a framework for thinking about how we think, whereas executive control involves monitoring how and when we apply our reading resources. Although the two topics will be discussed separately, lines between the two bodies of research are often blurred.

Metacognition is defined as the knowledge that a person has about the way his or her own cognitive processes work (Benjafield, 1997; Nicholson, 1999) or about the products of those processes or anything related to them (Flavell, 1976). Essentially thinking about one's own perceiving, understanding, and remembering, metacognition can be divided into metacognitive knowledge and metacognitive experiences (Garner, 1987). Metacognitive knowledge consists of "knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises" (Flavell, 1979, p. 907). Considered to be relatively stable, it is knowledge about ourselves and the strategies we employ in the various tasks that we face (Garner, 1987). In contrast, metacognitive experiences most have to do with a person's successful progress toward completion of a given study activity; they are likely to occur before, during, and after reading (Garner, 1987). Of importance, the strategies involved in metacognition can be either cognitive or metacognitive. In short, cognitive strategies are used to make cognitive progress, but metacognitive strategies monitor such progress (Garner, 1987).

Research on reading comprehension and "executive control" has also been useful in understanding the processes involved in reading and reading comprehension (Garner, 1987). Specifically, executive control involves a set of critical "control processes" that assists a person in the efficient use of his or her limited-capacity processing system. These executive control processes direct a person's cognitive activities at each stage of reading comprehension, thus making sure that the system functions as a whole throughout the multiple processing steps (Garner, 1987). These processes slow the reader down, allowing him or her to allocate extra processing capacity to various problem cognitive areas. Wagner and Sternberg (1987) divided executive control of reading into three steps:

(a) Accessing previously devised strategies or devising new ones for optimal allocation of reading time and effort, given the reading goals and text.

(b) Implementing the strategies in a manner that does not disrupt the reading process unnecessarily.

(c) Monitoring the success of the strategy implementation which may lead to revision or outright replacement of the strategy.

These steps allow people to determine how and where to apply their limited reading resources to the ultimate goal of reading comprehension. They imply that readers who are confronted with unexpected or apparently irrelevant materials will slow down to evaluate whether or not these materials need to be comprehended, and if so, how they should be comprehended.

Component Skills of Reading Comprehension

As the above review indicates, many skills contribute to a person's reading comprehension level. In fact, taxonomies of reading "comprehension abilities often categorize the component skills and processes as ones that occur higher or lower in the language processing chain" (Cain et al., 2004, p. 32). For instance, word recognition skills are considered to be lower level skills, whereas inference making is considered a higher level skill that aids in the construction of meaning-based representations of the text in question (Cain et al., 2004; Hannon & Daneman, 2001). As previously discussed, WM affects a person's ability to carry out the many processes associated with construction of such a text representation (Cain et al., 2004). Slow or inaccurate word reading supposedly "affect[s] comprehension by using up too much processing capacity with little remaining for text comprehension processes such as integration and inference" (Cain et al., 2004, p. 32; See Hannon & Daneman, 2001).

Sources of Individual Differences in Reading Comprehension

Reading comprehension is a complex cognitive skill. As a result, one might suppose that "any of [its] component processes or resources has the potential for being a source of individual differences in reading ability" (Hannon & Daneman, 2001, p. 103). However, many reading-ability theories have touted a single component as the primary source of such individual differences (Hannon & Daneman, 2001). For instance, some theories emphasize word knowledge or recognition skills as the primary source, whereas others "emphasize the higher level language comprehension processes that compute the semantic, syntactic, and referential relationships among successive words, phrases, and sentences in a text" (Hannon & Daneman, 2001, p. 104). In contrast, knowledge-based

theories hold that less skilled readers are disadvantaged with respect to all processes that require integration of newly encountered information with information recovered from long-term memory (LTM) (Hannon & Daneman, 2001).

Although single-component approaches to understanding reading ability are useful, they do "not allow researchers to determine the relative contributions of individual differences in the various components to individual differences in overall reading comprehension ability…nor [do they] allow researchers to determine the extent to which the various components make independent contributions to reading comprehension ability" (Hannon & Daneman, 2001, p. 104). As a result, some researchers have administered a battery of tests to determine the source or sources of individual differences. One general finding is that after readers get beyond the beginning stages of reading, lower-level word recognition and lexical access processes account for little variance in reading comprehension (Hannon & Daneman, 2001). Instead, higher-level processes common to both reading and listening comprehension account for substantial variance in reading comprehension ability (Hannon & Daneman, 2001). Furthermore, this research has found that some component processes, such as vocabulary knowledge and WM capacity, contribute independently to reading comprehension (Hannon & Daneman, 2001).

Research on individual differences in reading comprehension has also shown that a person's reading comprehension is dependent on reading context. For example, "words in context are read faster than the same words out of context" (Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003, p. 720). In fact, reaction time studies indicate that context differentially facilitates more and less skilled readers' comprehension: Less skilled

readers consistently benefit more from contextual cues than do skilled ones (Jenkins et al., 2003). The interactive compensatory model of reading comprehension is based on these findings (Jenkins et al., 2003). According to this model, bottom-up (print-driven) and top-down (meaning-driven) processes operate together when a word is encountered in sentence context (Jenkins et al., 2003). Whether a reader relies on context to expedite word recognition depends on the efficiency of his or her bottom-up or print-driven processes (Jenkins et al., 2003).

According to research on the interactive compensatory model of reading comprehension, skilled readers have word-identification processes that operate extremely fast, before slower hypothesis-forming or top-down processes are finished (Jenkins et al., 2003). As a result, skilled readers rarely need to rely on deliberate prediction to identify words in context (Jenkins et al., 2003). In fact, as a reader's skill increases, his or her word identification or recognition becomes much faster because it is "more encapsulated – able to execute without recruiting background knowledge or employing expectancy-based processing" (Stanovich, 1991, p. 432). In contrast to skilled readers, less-skilled readers have inefficient word-processing skills that operate more slowly than hypothesis-forming or top-down word-prediction processes (Jenkins et al., 2003). Accordingly, research indicates that "the information-processing system is arranged in such a way that when the bottom-up stimulus analysis processes that result in word recognition are deficient, the system compensates by relying more heavily on other knowledge sources (e.g., contextual information)" (Stanovich, 1991, p. 432). These findings suggest that contextual influences on word recognition speed are not a primary source of individual

differences (Daneman, 1991). Instead, these effects are due to differences in the speed of the bottom-up processes of word recognition (Daneman, 1991).

The Role of Interest in Learning

Readers' interest in learning particular material has implications for both psychology and education (Krapp, Hidi, & Renninger, 1992). Although the concept of interest can be conceptualized in a number of ways, common to most definitions is the assumption of a "person-object relation" or "person-stimulus interaction," or the assumption that "interest is a phenomenon that emerges from an individual's interaction with his or her environment" (Krapp et al., 1992, p. 5). Furthermore, although the degree of significance placed on this interaction varies, most researchers acknowledge that interest virtually always begins via some form of person-environment interaction (Krapp et al., 1992).

Research has focused on two distinct levels of interest: individual and situational (e.g., Hidi, 2001; Krapp et al., 1992). Individual interest is a psychological state that influences various types of cognitive performance, such as learning (Krapp et al., 1992). Differences among individuals in such interests should lead to individual differences in cognitive processing of information. In contrast, situational interest factors are specific characteristics of learning environments that capture the interest of many individuals (Krapp et al., 1992). Differences among situations should lead to group differences in cognitive processing.

These two levels correspond to differing methods of identifying interest as a psychological state (Krapp et al., 1992). Individual interests are obviously specific to individuals and are also considered to be generally stable. They tend to develop slowly,

be long lasting, and are associated with increased knowledge and positive emotions (Hidi, 2001; Krapp et al., 1992). Individual interests have been described as either dispositional or actualized. Dispositional ones are viewed as relatively enduring characteristics or general orientations to action that develop in the individual over time (Krapp et al., 1992). Actualized ones, of interest to process-oriented theories of learning, are said to show themselves in prolonged, focused, relatively effortless attention that is accompanied by concentration and feelings of pleasure (Krapp et al., 1992). In contrast, situational interests are generated by conditions, stimulus characteristics, or concrete objects in the environment, such as textbooks and films (Krapp et al., 1992). Examples of situational interests are the ways in which readers "react to seductive details, surprise-ending stories, and interesting sentences" (Krapp et al., 1992, p. 8). They are evoked by something in a person's immediate environment and may or may not have a long-term effect on the person's knowledge and value (Hidi, 2001). In addition, situational interest has two possible stages, one in which interest is triggered and another subsequent one through which that interest is maintained (Hidi, 2001). Thus, different ways of presenting material in textbooks and films should evoke different degrees of situational interest.

Research on text-based learning has shown that text characteristics such as novelty, life themes, character identification, intensity of action, and imagery value apparently foster situational interest (Krapp et al., 1992). Further, emotional and cognitive interest may differentially affect readers. According to Kintsch (1980; see also Hidi, 2001) events having a direct emotional impact arouse emotional interest whereas unexpectedness or novelty arouse cognitive interest. In fact, all types of interest facilitate readers' recall and comprehension (Hidi, 2001). Studies on children and college students

have shown that "comprehension, inferencing and retention [are] facilitated by personally interesting text segments as well as by passages written on high interest topics" (Hidi, 2001, p. 195-196). In addition, researchers have also concluded that interest increases not only the amount of text information recalled, but also the quality of learning (Hidi, 2001). Simply put, interest seems "to motivate readers to go beyond the surface structure of the texts and focus on the main ideas and their underlying meaning" (Hidi, 2001, p. 196).

As would be expected, increasing either individual or situational interest in text material increases text comprehension (Schiefele, 1992). Interesting text material motivates people to read, influences comprehension, and also tends to result in qualitatively and quantitatively superior learning (Krapp et al., 1992). Interest is especially important when deep comprehension of text content is required (Hidi, 2001; Schiefele, 1992). On the other hand, Garner et al. (1989; See also Garner et al., 1992; Wade, 1992) demonstrated that increasing interest in unimportant information might interfere with the learning of important ideas in the text.

The Theory of Selective Attention

The theory of selective attention, which has received considerable research support, helps to explain how interest leads some kinds of information to be recalled better than others (Anderson, 1982; Wade, 1992). This theory proposes a positive linear relationship between the extent to which a reader attends to a text element and the extent to which that element will be recalled. The model also implies a causal relationship between learning, interest, and attention: Interesting information, which is often vivid, suspenseful, and dramatic, will likely attract a reader's attention (Shirey, 1992).

Although interesting information requires no more effort to learn than do other types of information, the increased attention paid to such information will ultimately result in better recall (Wade, 1992). Unfortunately, interesting information is often superfluous and little related to the main text ideas. Individuals attending to such material are therefore not "selectively allocating cognitive resources to information necessary for them to meet their learning goals" (Wade, 1992, p. 267), and may therefore recall the interesting, but essentially irrelevant, material better than other more important text information.

Although research supports the ability of the theory of selective attention to explain the recall of structurally important information, recent research has raised questions about its usefulness in explaining the recall of interesting but unimportant information. For instance, Hidi (2001, p. 200) suggests that "[e]stablishing interestingness of text does not require the same kind of evaluation and decision making process as establishing structural importance…[and readers] tend to instantaneously recognize interesting information and spontaneously allocate attention as they process it." Some research supports Hidi's (2001) concerns. For example, McDaniel, Waddill, Finstad, and Bourg (2000, p. 492), found that "[m]ore interesting stories required fewer attentional resources for comprehension than did less interesting stories." Their series of experiments, based on Hidi's (1990) suggestion that increased interest fosters increased automaticity of attentional allocation, provided the "first direct evidence supporting the theoretical idea that increased text-based interest may actually reduce some of the attentional demands required to process texts" (McDaniel et al., 2000, p. 496).

In their first experiment, McDaniel et al. (2000) presented six stories, which had been previously rated according to interest, to 38 male and 56 female undergraduate students. Two of these stories, which were designated as "baseline stories," were presented to participants and mean reading times were computed. These mean reading times were used to estimate reading time for the four target stories, which were those used in the experimental manipulation. Students were then instructed to read the four target stories while pressing the space bar to random audible tones (McDaniel et al., 2000). Data analysis showed that "the tones were responded to significantly more quickly when embedded in the more interesting texts than in the less interesting texts" (McDaniel et al., 2000, p. 495). The experimenters also found a significant interaction such that high and low interest reaction times were "nearly equivalent for early portions of the texts, whereas they diverged substantially at later portions" (McDaniel et al., 2000, p. 495). Simple effects tests showed that reaction times for the second half of the narratives were significantly longer for less interesting narratives than those for the more interesting narratives (McDaniel et al., 2000). These findings indicate that participants allocated less attention to the latter half of high-interest stories than to the latter half of low-interest stories (McDaniel et al., 2000).

In their second experiment, McDaniel et al. (2000) examined possible explanations for their finding that reading less interesting stories required more resources than did interesting stories (See Experiment 1). McDaniel et al. (2000) presented participants with either an interesting or less interesting text passage and measured both free recall and cued recall (McDaniel et al., 2000). The experimenters used the six stories from Experiment 1, each adjusted as necessary for a given condition. Participants in the

control condition were presented with one of the six stories in the exact form as that presented in Experiment 1 and were instructed to read the story and attempt to understand it. Participants in the letter-deletion condition were instructed to write in missing letters in the blanks provided. Participants in the unscramble condition were instructed to rearrange scrambled sentences to clarify their meaning (McDaniel et al., 2000). Free recall and cued recall scores were calculated for the letter-deletion condition and the unscramble condition by comparing recall scores to those of the control group.

Results from Experiment 2 indicated that neither free recall nor cued recall differed significantly for low-interest narratives relative to high-interest narratives for the read-only control condition (McDaniel et al., 2000). These findings replicated and extended the free recall results from Experiment 1. In addition, the results of this second experiment illustrated that high and low-interest narratives differed in terms of the processing manipulation (i.e., letter-deletion condition vs. unscramble condition) that was most beneficial to reading comprehension (McDaniel et al., 2000). The end result of this experiment was that sentence unscrambling improved recall of less interesting narratives, whereas letter deletion improved recall of interesting narratives (McDaniel et al., 2000).

Similar to Hidi (1990, 2000), Lavie, Hirst, de Fockert, and Viding (2004) have proposed a two mechanism load theory of selective attention and cognitive control. Their first mechanism posits that a passive perceptual selection mechanism excludes stimuli from perception under high perceptual load situations. Thus, irrelevant and distracting material is prevented from interfering with comprehension because such irrelevant material is not perceived when too little capacity is available to process it (Lavie et al., 2004). Second, an active attentional-control mechanism rejects irrelevant distractors

when they are perceived in situations of low perceptual load. This second mechanism depends on higher cognitive functions, such as working memory, that are necessary to maintain actively current processing priorities and ensure that low-priority stimuli do not gain control of reading (Lavie et al., 2004).

Lavie et al. (2004, p. 348) reported several experiments indicating "that perceptual load and working memory load have opposite effects on selective attention." Their experiments combined a short-term recognition memory task with a selective attention task (Lavie et al., 2004). Participants were instructed to respond to a target, presented in the center of the computer screen, while ignoring an irrelevant distractor presented in its periphery (Lavie et al., 2004). In addition, Lavie et al. (2004) manipulated working memory load by varying memory set size: participants were instructed to memorize either one (low working memory condition) or six (high working memory condition) digits per trial. Perceptual load was manipulated by varying the number of distractors in the selective attention task: participants in the low perceptual load condition were presented with a single target letter located centrally and one irrelevant distractor in the periphery whereas participants in the high perceptual load condition were presented with five nontarget letters and one target letter, all located centrally on the computer screen (Lavie et al., 2004).

Comparisons of response times indicated that high working memory load increased distractor interference in the selective attention task whereas high perceptual load decreased distractor interference in the same task. Lavie et al. (2004) claimed that the differences between the effects of high working memory load and high perceptual load on interference by distracting material supports their proposal that two mechanisms

control the extent to which selective attention efficiently rejects distracting and irrelevant material.

Methods of Instruction and Student Learning

Although the previously discussed aspects of cognitive psychology and reading comprehension most definitely contribute to the rationale behind the present study, equally important is the study of learning and the factors that affect it. Specifically, the study of methods of instruction and student learning gives insight into the processes at work in the classroom and with respect to textbook use in our schools.

General Principles of Learning and Instruction

Several general principles are apparent across numerous theories of learning and instruction. They will be divided into two types for this review: 1) Strategies students use to learn or perform a task or exhibit expertise; and 2) Strategies instructors use to help their students learn to learn.

Student Strategies

Students need four strategies in order to acquire expertise: domain knowledge, heuristic strategies, control strategies, and learning strategies. Unless otherwise cited, information in this section is from Collins, Brown, & Newman (1989). Domain knowledge includes factual and conceptual knowledge and procedures that are explicitly identified with a given subject matter. Although important, domain knowledge provides insufficient clues to students about how to solve a problem or carry out a task. In fact, domain knowledge that is learned in isolation from realistic problem contexts tends to remain inert, even for successful students, in situations for which it is appropriate. Heuristic strategies are non-universal conditionally-true working principles for which the

relevant conditions cannot be completely specified (Anderson & Armbruster, 1990). They are generally effective techniques or approaches for accomplishing tasks that are helpful when applied in appropriate situations, but which do not always work. Although explicitly taught heuristics exist for subjects as diverse as mathematics, reading, and writing, most heuristics are acquired tacitly by experts through practice in problem solving.

The remaining two student strategies are more general than the first two. The third strategy suggests that once a student has learned a great deal of domain knowledge and many learning heuristics, he or she will probably need a control strategy that directs the process of carrying out a task and helps manage various heuristics and strategies. These strategies operate at many levels and generally require the student to reflect on the process of problem-solving in order to determine how to proceed. The fourth strategy, learning strategy, is used for any other kind of content. Learning strategies describe how to learn and range from general methods of exploring new topics to more specific methods of reconfiguring knowledge as needed for carrying out complex tasks.

Teaching Strategies

Teaching strategies are designed to help instructors teach their students how to learn about specific subjects or types of knowledge. Six general teaching methods are described by both Anderson and Armbruster (1990) and Collins, Brown, and Newman (1989): modeling, coaching, scaffolding, action orientation or exploration, articulation, and reflection. In modeling, a student observes an expert carrying out a task in order to build a conceptual model of processes required for that task. The expert often makes explicit mental processes that would otherwise remain unclear to a novice (Anderson &

Armbruster, 1990; Collins et al., 1989). In coaching, an expert provides hints and feedback to the student who is attempting to carry out a task.

Scaffolding involves "providing teacher support and regulating task difficulty so that the level of challenge is optimum for growth toward expertise" (Anderson & Armbruster, 1990, p. 400). Such support can take many forms including suggestions or help on a task (Collins et al., 1989), and requires sensitivity to the student's skill level and developmental progress (Anderson & Armbruster, 1990). In the beginning of an exercise involving scaffolding, teachers generally perform a majority of the joint activity (Guthrie, Wigfield, & Perencevich, 2004). As student expertise increases, "teachers transfer responsibility for performance in an activity more completely to the student" (Guthrie et al., 2004, p. 59). Closely related to scaffolding is a method described as either "action orientation" (Anderson & Armbruster, 1990) or "exploration" (Collins et al., 1989), in which teachers assist students in becoming active participants in their own learning by leading them into their own method of problem solving. Such personal involvement or action facilitates student development of a link between procedural knowledge ("knowledge how") and conceptual knowledge ("knowledge that") (Anderson & Armbruster, 1990, p. 398).

The last two general teaching methods, articulation and reflection, are also closely related. Specifically, articulation involves teaching students "to articulate their knowledge, reasoning, or problem-solving processes in a domain," whereas reflection enables students "to compare their own problem-solving processes with those of an expert, another student, and ultimately, an internal cognitive model of expertise" (Collins et al., 1989, p. 482). Use of the last two methods involves the gradual withdrawal of

external scaffolding while an internalized model of expertise develops over the course of instruction (Anderson & Armbruster, 1990).

Additional important general teaching methods involve the presentation of information or the ways in which learning is sequenced. The first, "global before local skills" (Collins et al., 1989) or "whole to part," holds that students should initially be helped to acquire a conceptual model of the way in which parts of a problem or situation fit together (Anderson & Armbruster, 1990). Because a sense of the whole problem or situation generally facilitates learning, subsequent sub-skills and other sub-concepts should be taught within the context of the whole (Anderson & Armbruster, 1990). The second general teaching method, "authenticity," holds that instruction should be based as much as possible on "the real world" so as not to appear oversimplified (Anderson and Armbruster, 1990). This method is similar to Collins et al.'s (1989) "situated learning" which holds that students should solve problems and carry out tasks in environments that accurately reflect the multiple uses to which their knowledge will be put in the future.

The remaining sequencing methods described by Anderson and Armbruster (1990) involve the presentation of multiple perspectives on a given subject in a developmentally appropriate order. For instance, "multiple perspectives" describes the examination of authentic cases and tasks from multiple viewpoints as a method of helping novices develop the cognitive flexibility needed to cope with complexity and novelty. However, the authors also indicate, through their "development progression" method, that such material should be presented in stages of increasing levels of complexity and diversity (Anderson & Armbruster, 1990). These methods therefore reflect the position that teachers should construct the sequences of tasks and situational

task environments in a progressive manner such that a greater variety of skills and concepts are required.

Evaluation of Current Textbooks in the United States

An ongoing debate exists in the United States regarding the general classroom practice of attempting to teach students as much information as possible. Specifically, some researchers argue that schools, especially high schools, are apparently addicted to coverage: students are exposed to broad surveys of content of various disciplines as well as to numerous skill and competency sets (e.g. Newmann, 1988). According to Dempster (1993), three beliefs about human learning appear to be behind this approach: 1) "More is better": Any additional information enriches the meaning of a lesson and assists in learning; 2) Exposure to additional knowledge will not hurt a student's ability to learn; and 3) Most students are capable of learning most things quickly, and once such learning has been satisfactorily demonstrated, no further practice is needed.

Evaluation of textbooks used in schools and colleges in the United States indicates that our students are often briefly exposed to large amounts of information in many curricular domains (Dempster, 1993). The principles and methods of teaching and learning described above imply that increased depth, rather than breadth, of coverage in textbooks would be more conducive to learning (Newmann, 1988). However, textbooks in the United States have historically been unrivaled in both size and the amount of information relative to those in other countries (Dempster, 1993). Increased depth of coverage would involve "the sustained study of a given topic that leads students beyond superficial exposure to rich, complex understanding" (Newmann, 1988, p. 346), and would reduce breadth to realistic levels. Unfortunately, many textbooks in the United

States make so many demands on both teachers and students that teachers cannot realistically cover, nor students absorb, all the material. Thus, students may miss the major points of a lesson (Dempster, 1993).

Evolution of Psychology Textbooks in the United States

The evolution of psychology textbooks in the United States largely parallels that of textbooks generally. Beginning with the advent of student-oriented textbooks in the 1930s-40s and continuing with the trend towards encyclopedic textbooks in the 1950s-60s, psychology textbooks have contained increasing amounts of information, some meaningful and some extraneous, that teachers must attempt to teach and students must attempt to learn. All material and quotations in this section are from Weiten & Wight, (1992).

Only in the 1970s-80s during the "Era of Artwork, Pedagogy, and Homogenization," (p. 469) did the length, number of figures and tables, pedagogical aids, and photographs in psychology textbooks dramatically increase - as did the amount of extraneous information. For instance, the first edition of the introductory text, Psychology Today (1969), included visually stunning text and snazzy graphics. Reviews described the content as "uneven, unbalanced, and poorly integrated" (p. 470). Nevertheless, it was a huge financial success. Psychology Today was also the first "managed text" in higher education, "conceived, designed, and composed by a team of editors and professional writers," using professors only as consultants (p. 470). Regardless of its problems, Psychology Today became the model for many subsequent managed texts.

The rapid expansion of higher education to include students of lesser ability and non-traditional students with less time for studying in the 1970s led to concerns about students' academic skills. In response to such concerns, texts began increasingly to incorporate such pedagogical aids as running glossaries on text pages, pronunciation guides for technical terms, case histories and fictional anecdotes, as well as review questions to engage student interest and assist learning. Commentators viewed many of these changes, combined with the homogenization of introductory psychology textbooks, as detrimental to the study of psychology.

The Role of Text in Classroom Learning

Literature on the use of texts has recently been reviewed by Wade and Moje (2000), from which material and quotations in this section are taken unless otherwise indicated. Texts "are organized networks that people generate or use to make meaning either for themselves or for others" (p 609). Variations in the way texts are used in American classrooms reflect:

> differences in pedagogical approach and in purpose (e.g., learning goals)…[and] also differences in students, subject area, grade level, academic track or reading group level, systems of assessment and accountability, content and pedagogical knowledge of teachers, teachers' and students' beliefs about knowledge and appropriate uses of literacy, beliefs about the purpose of schooling, past school experiences, and home and community experiences (p. 610).

The above variables can be divided into two types of pedagogy: transmission approaches and participatory approaches. These are not the only categories of pedagogical approach

and although one of the two will generally predominate in a classroom, elements of others may also be used at the same time.

The transmission model is the dominant pedagogical approach to teaching subject-area content and reading in the United States. Under this model, the role of teacher and text is to transmit a large body of "official" skills and knowledge to students who are generally thought of in generic terms, without distinction on the basis of student variables such as gender, class, and race. As such, instruction using a transmission approach is both teacher and content centered. Texts determine which authors, topics, content, skills, and ideologies are considered legitimate and valued – in essence, what counts as knowledge and learning (Shannon, 1990).

Transmission approaches and participatory approaches differ in two primary ways: first, whereas "transmission approaches cast the teacher – and texts – as controllers of knowledge and learning, these alternative pedagogies invite students to participate in the construction of knowledge and in the construction of texts" (p. 617). Second, whereas transmission approaches view texts as repositories or guardians of information, participatory approaches view texts as tools for learning and constructing new knowledge. In addition to the above mentioned differences between transmission and participatory approaches, participatory approaches also rely on a wider range of texts than do transmission approaches. For instance, participatory approaches rely on published print magazine materials, student-generated writings, presentations, and notes, oral discourse, electronic texts read and generated on the Internet, television, radio, and film media, and performance and visual art.

Text Presentation and Organization

Text coherence and organization significantly affect reading comprehension (Kobayashi, 2002). In fact, "[c]ognitive load theory suggests that some texts and learning environments impose greater information processing demands on working memory than others" (McCrudden, Schraw, Hartley, & Kiewra, 2004, p. 289). In this context, cognitive load may vary due to intrinsic or extraneous demands. Intrinsic-load demands result "from the properties of the to-be-learned information" (McCrudden et al., 2004, p. 289). For instance, familiar information is low in intrinsic cognitive load, whereas unfamiliar information is high in intrinsic cognitive load due to the learner's lack of prior knowledge (McCrudden et al., 2004). In contrast, "[e]xtraneous load results from the design characteristics of to-be-learned information" (McCrudden et al., 2004, p. 290). "Most cognitive load research has examined the effect of extraneous variables because intrinsic cognitive load is difficult to control experimentally" (McCrudden et al., 2004, p. 290). As a result, extraneous variables will be discussed further below.

Text Presentation

Text Presentation refers to the format of a given text, and "[r]esearch has shown that different text presentation formats differentially affect extraneous cognitive load" (McCrudden et al., 2004, p. 290). Formats that allow for referral and provide external representations, or visible records on paper "are beneficial because the reader does not have to rely exclusively on internal representation of the text" (McCrudden et al., 2004, p. 290). Furthermore, studies have demonstrated that "spatially contiguous text and animation (i.e., text integrated with referent animation) … [and] viewer control on the pace of presentation (e.g., computer-controlled pace or self-paced) … positively and

independently influence learner performance" (McCrudden et al., 2004, p. 290-291; See Mayer & Chandler, 2001 and Moreno & Mayer, 1999 for descriptions of individual studies).

Text Organization

Text organization refers to the spatial organization of related idea units in a given text. Research indicates that well-organized text reduces extraneous cognitive load because less effort is needed to search for and maintain related information and to integrate related idea units within the text (McCrudden et al., 2004). For instance, "[c]ollege students who read…integrated text spent less time reading and correctly answered more short-answer recall questions than students who read … separated text" (McCrudden et al., 2004, p. 291). These and other studies illustrate that "as text organization declines and related segments become less contiguous, learning decreases…due to the greater cognitive load imposed by poor organization and noncontiguity" (McCrudden et al., 2004, p. 291).

Seductive Details

Among the elements in textbooks that have increased in recent decades are various types of information that are intended to enrich the meaning of the central text information, but are not directly relevant to it. Called by some "seductive details" (Garner et al., 1992; Harp & Mayer, 1997; Menke, 1992; Wade, 1992), they are "interesting but irrelevant details that are added to a passage to make it more interesting" (Harp & Mayer, 1997, p. 72). Most textbooks now contain numerous seductive details including illustrations, facts, names, and examples (Dempster, 1993). Research on their effects is inconsistent (Dempster, 1993, Garner et al., 1992; Garner et al., 1989; Wade,

1992). Although the value of seductive information in textbooks was supported by early research conducted with traditional laboratory materials, such as lists of arbitrarily paired words, some more recent research suggests that such details impair learning and that readers might benefit from omission of this extraneous information (Dempster, 1993, Garner et al., 1992; Garner et al., 1989; Wade, 1992). Yet other research reports no effects of extraneous details (Goetz & Sadoski, 1995a & 1995b; Schraw, 1998). The following sections describe separately positive and negative findings.

Positive Findings Regarding Seductive Details

In an early series of experiments, Garner et al. (1989) studied the effects of seductive details on recall by graduate students and seventh-graders. Half of the readers at each level read a passage with seductive details and half read a passage without seductive details. In experiment one, conducted on graduate students, the authors wrote a three paragraph passage describing differences among insects. They created the seductive details text version by inserting a sentence in each paragraph that described interesting but irrelevant details. Tested individually, participants first silently read their assigned version of the text. Then, with the text passage unavailable, participants were asked to tell the experimenter "just the really important information you read about insects, not all the information, just the really important information" (Garner et al., 1989, p. 47). Scores on this question ranged from zero to three, depending on the number of main ideas the student identified correctly. Participants then rated the interestingness of the passages. Finally, the experimenter selected one of nine pictures of insects and instructed each participant to select an insect (American cockroach, viceroy butterfly, or mud dauber wasp) that differed from the insect in the picture selected by the investigator.

Participants were then instructed to explain why they selected a given insect as different from the one presented by the investigator. Graduate students who read the no-seductive details version remembered more main ideas than did those who read the seductive details version. In fact, participants reading the passage without seductive details recalled an average of 93% of the ideas rated as most important, whereas participants reading the passage with seductive details recalled an average of only 43%.

In experiment two, Garner et al. (1989) studied the effects of seductive details and the signaling of a passage's main ideas on macroprocessing, which was measured by participant recall of important information. The authors asserted that one factor that makes macroprocessing more difficult is the absence of semantic signaling, or "the absence of an explicit main-idea statement" (p. 42). In addition, the authors expected that seductive details would interfere more with macroprocessing for less mature readers, especially if information-processing demands were made excessive because the "macrostructure of an exposition is not signaled redundantly and … the microstructure of the text contains irrelevant information" (p. 45).

Garner et al. (1989) tested 36 seventh-grade boys and girls, all of whom were classified as "average" readers based on achievement test scores and teacher evaluations. To study seductive details, as well as the effects of signaling on comprehension and retention, the authors randomly assigned the children to one of three conditions:

(a) seductive details and minimal signaling of the main idea (replicating a condition in the first study)

(b) no seductive details and minimal signaling of the main ideas (also replicating a condition from the first study)

(c) no seductive details and semantic, lexical, and graphic signaling of the main ideas

(Garner et al., 1989, pp 49-50).

Text versions and instructions in conditions (a) and (b) were identical to those used in experiment one. The text version and instructions used in condition (c) differed from the original or unembellished text version in experiment one only in terms of the amount of signaling used in the passage. As expected, children who received minimal signaling and seductive details (condition a) performed significantly worse than did either those who received redundant signaling and no seductive details (condition c) or those who received minimal signaling and no seductive details (condition b). Across the two experiments, seductive details disrupted recall of important information in both skilled adult readers (graduate students) and school children (seventh-graders) (Garner et al., 1989).

A set of studies by Wade and Adams (1990) also found relative high interest in and recall of seductive details. In their first experiment, they tested 52 female and male college students of diverse majors, reading ability, and self-rated interest in the topic about which they were to read. Students read two versions of a 1,700 word text on the life and career of Horatio Nelson: text in regular manuscript form, and text in one sentence units, each followed by a 4-point scale (1=not at all important or interesting; 4=very important or interesting). Students were given the manuscript form first and told to read it for general understanding and then the segmented form and told to assign one quarter of the sentences to each of the 4 point interest/importance scale. Results indicated that the subjects rated the main ideas as important but uninteresting and seductive details as unimportant but interesting. In their second experiment, Wade and

Adams (1990) tested 48 college female and male students. The participants read the same text passage as in experiment one, but were then instructed to write down, without the aid of the passage, as much about it as they could. Participants best remembered seductive details and main ideas.

Other studies have also found seductive details effects (Garner, Alexander, Gillingham, Kulikowich, & Brown, 1991; Garner et al., 1992; Harp & Mayer, 1997; Wade, 1992). Generally, adding seductive details to a text passage either did not aid or actually reduced students' recall of main text ideas. Further, readers were more likely to remember interesting facts than important facts from a passage (Garner et al., 1992; Harp & Mayer, 1997), possibly due to increased attention given to the seductive details (Wade, 1992).

Researchers use many different methods to create the seductive details versions of their passages. For instance, whereas Garner et al. (1989) adapted their original text version by adding three seductive sentences, Garner et al. (1991) failed to include an "original" text version devoid of seductive details in their series of experiments. Garner et al. (1991) used four variations of a paragraph about Stephen Hawking, the noted physicist, which differed according to placement of seductive details:

(a) interesting detail presented as an aside (in a separate paragraph, rather than embedded in paragraphs presenting important generalizations) in generally interesting text (form A)

(b) interesting detail presented as an aside in generally uninteresting text (form B)

(c) interesting detail embedded in a paragraph in generally interesting text (form C), and

(d) interesting detail embedded in a paragraph in generally uninteresting text (form D)

(Garner et al., 1991, p. 647).

The interesting or seductive details, which appeared in all versions of the text, described a bet involving black holes between physicists Steven Hawking and Kip Thorne. In addition, forms A and C began with information about Hawking's illness, which was intended to be personally involving, and which was not in forms B and D. Forms A and C of the text were obviously longer than forms B and D, creating a confound.

In experiment one, Garner et al. (1991) instructed 48 undergraduate students to read their version of the text and to try to remember the important information. After reading the text, students completed three recall measures without the aid of the passage: 1) recall "really important information that you read;" 2) create a title that "might give a reader of a science textbook a good idea of what the text is about;" and 3) respond to five short-answer questions (Garner et al., 1991, p. 649). Scoring was based on previous ratings by eight doctoral students of each passage for importance and interest. Results showed a seductive details effect: "ideas rated as high interest/low importance and as moderate interest/moderate importance were frequently recalled, while ideas rated as low interest/high importance were less frequently recalled" (Garner et al., 1991, 651). Interest was a better predictor of recall than was importance, regardless of whether seductive details supported important ideas in the text. The information about Hawking's illness did not affect recall of forms A and C.

In experiment two, Garner et al. (1991) tested 228 undergraduate students on the effects of domain knowledge, or knowledge about a particular topic, on text recall. They used a 25-item multiple-choice test to measure domain-knowledge. Course instructors gave the test to students one week prior to students' reading the Hawking text. Except for this test, the materials were the same as those used in experiment one. Results again showed better recall of interesting detail than important generalizations. In addition, interestingness of the passage affected recall: Students who had low domain knowledge and who read generally interesting as opposed to generally uninteresting text recalled more of the important generalizations. The results of experiments one and two provide additional evidence for the existence and power of a seductive details effect in learning from text, but the lack of a true control passage is a limitation.

Recent findings by Harp and Mayer (1997; 1998) indicate that seductive illustrations may impair reading comprehension. In their 1997 series of experiments, they used four booklets of text and illustrations describing the formation of lightning. The base or non-seductive booklet consisted of approximately 550 words and six black-and-white captioned illustrations. The authors modified the material to form three new versions: a base-plus-seductive-text booklet had an added 150 words, intended to make the passage more interesting; a base-plus-seductive-illustrations booklet consisted of the base booklet and six captioned color pictures of lightning; and a base-plus-seductive-text-and-seductive-illustrations booklet contained both the added text and color illustrations. The added information in the new versions created a confound by lengthening all versions over the base text.

In experiment one, Harp and Mayer (1997) gave introductory psychology students one of the four text booklets and instructed them to read their booklet once, carefully and at their normal reading rate. The experimenters then told the students to write everything they remembered from the passage in six minutes. Results indicated that the base-version group recalled significantly more relevant idea units than did the other three groups and that the base-plus-seductive-text-and-seductive-illustrations group recalled significantly fewer relevant idea units than the other groups.

In their second experiment, Harp and Mayer (1997) instructed students to read the base-plus-seductive-text-and-seductive-illustrations passage and then to rate separately the base text, seductive text, captioned illustrations, and seductive illustrations in terms of emotional interest, entertainment level, and cognitive interest (the degree to which material helped understanding). Students rated the seductive text and illustrations relatively high in emotional interest but relatively low in cognitive interest, and rated the base text and seductive illustrations relatively low in emotional interest but high in cognitive interest. Harp and Mayer (1997) concluded that the results provided support for a cognitive interest theory of seductive details. According to cognitive interest theory, the presence of seductive text or illustrations disrupts text cohesiveness, distracting readers from attending to more important information (Harp & Mayer, 1997).

Harp and Mayer's 1998 experiments also support the notion that seductive details "interfere with learning by priming inappropriate schemas around which readers organize the material" (p. 414). Those studies used the same passages describing lightning as did their 1997 studies and tested among predictions drawn from three hypotheses concerning seductive details. According to the distraction hypothesis, seductive details distract a

reader's selection processes away from important information (Harp & Mayer, 1998). Revising lessons containing seductive details to guide a reader's selection processes toward structurally important ideas should minimize the seductive details effect. For example, Harp and Mayer (1998) highlighted the major steps in lightning formation in passages designed to test the distraction hypothesis. The disruption hypothesis asserts that seductive details interrupt the structure of a passage, and therefore the transition from one main idea to the next, by interfering with construction of a coherent mental representation of the text. If this hypothesis is correct, then the addition of organizational signals to a passage, such as number signals and preview sentences, should help the reader organize important main ideas more effectively and reduce the seductive details effect. The diversion hypothesis asserts that seductive details prime inappropriate prior knowledge, which readers then integrate with new information. As a result, the reader builds a coherent mental representation, but not of the structurally important ideas from a passage. According to this hypothesis, presenting all irrelevant passage information at the beginning of a passage should exacerbate the seductive details effect, whereas presenting all irrelevant passage information at the end of a passage should reduce the seductive details effect (Harp & Mayer, 1998).

In experiment one, introductory psychology students read a passage with or without seductive details and with or without highlighting of the nine-link causal chain that leads to a flash of lightning, then wrote down everything they could remember from the passage, and finally completed four problem-solving questionnaires: (a) "Suppose you see clouds in the sky, but no lightning. Why not?" (b) "What does air temperature have to do with lightning?" (c) "What could be done to decrease the intensity of a

lightning storm?" (d) "What causes lightning?" (Harp & Mayer, 1998, p. 418). Students who read the passage without seductive details again performed better than those who read the passage with seductive details. In addition, highlighting did not help students either to retain the main ideas or to counter the seductive details effect.

Experiment two used the same procedure as experiment one except that Harp and Mayer (1998) added learning objectives in an attempt to guide students' selection of important information. Introductory psychology students read either the base or base-plus-seductive-text version of the lightning text. Some students were told prior to reading the passage that they should look for the steps involved in the formation of a lightning flash and that they should be able to explain what causes lightning. Other students were given no instructions. All students completed tests of recall and problem solving after reading the passage. Results replicated a seductive details effect on recall and transfer performance or problem-solving: Students who read passages with seductive details recalled fewer structurally important ideas and generated fewer problem solutions than did those who read passages without seductive details. In addition, the inclusion of specific learning objectives prior to reading the lighting passage helped students recall more of the passage's main ideas and generate more problem solutions than when such objectives were not given. The findings are largely at odds with the distraction hypothesis, but are consistent with the diversion hypothesis "because giving a statement of learning objectives prior to presenting the passage did not reduce the seductive details effect" (Harp & Mayer, 1998, p. 424). Effectively, students were able to build a coherent mental representation of the passage, but not of the structurally important ideas.

In experiment three, Harp and Mayer (1998) explored the disruption hypothesis by attempting to reduce the seductive details effect by guiding introductory psychology students' organization of text material. Materials included the base passage and seductive details booklets identical to those used in experiment one as well as two additional booklets: a base-passage-plus-signals booklet and a seductive-details-plus-signals booklet. Organizational signals were added to both new passages in an attempt to assist the reader in organizing the text structure. Signals included preview sentences, numbered sequential steps, and the addition of marker words such as "definition" in sentences containing definitions. The procedure was the same as those in the two earlier experiments. Results again revealed a seductive details effect: Students who read the booklet with seductive details recalled fewer structurally important ideas and generated fewer transfer solutions than did those who read the base passage without seductive details. Contrary to past findings (i.e., Garner et al., 1989), organizational signals did not reduce the seductive details effect. These results also provide additional evidence against both the distraction and disruption hypotheses, but are consistent with the diversion hypothesis, which asserts that seductive details prime inappropriate prior knowledge with which readers integrate new information. According to Harp and Mayer (1998, p. 426), if "the activation of an inappropriate base of prior knowledge is indeed responsible for the seductive details effect, then it is not surprising that attempts to guide students' selection processes to important ideas and attempts to help students to better organize the passage had no effect on reducing the damage caused by seductive details."

Harp and Mayer's (1998) final experiment explored the diversion hypothesis by priming either relevant or irrelevant prior knowledge as an integrating schema. The

authors predicted that seductive details within a passage would alter readers' perspectives by activating an inappropriate context based on their prior knowledge rather than an appropriate context based on structurally important ideas in the passage. Thus, early placement of seductive details should exacerbate and late placement reduce, respectively, the adverse effects of the details relative to distributing them throughout the passage. The authors tested these predictions by presenting students with a text passage that placed all seductive details either at the beginning or at the end of the passage.

Harp and Mayer (1998) used four versions of their booklet for experiment four: 1) base-passage; 2) seductive details throughout booklets; 3) seductive details at the beginning; and 4) seductive details at the end. Procedures and booklets 1 and 2 were the same as in experiments one through three. Introductory psychology students read one of the four booklets and then recalled information and used it to solve problems. The recall and problem solving of students who read booklets with seductive details at the beginning did not differ in either recall of important ideas or problem solving relative to students who read booklets with seductive details throughout. Furthermore, students recalled more seductive details when the details were at the beginning of the booklet than when they were at the end. Early placement apparently primed readers to use seductive details to organize the remainder of the passage. Of importance, students who read the seductive details at the end booklet recalled and solved problems as well as did those who read the base-passage with no seductive details. Harp and Mayer (1998) suggested that seductive details at the end did not degrade performance because they did not prime students to use them to organize their understanding of the passage. Again, results are

inconsistent with the distraction and disruption hypotheses, but consistent with the diversion hypothesis.

Most recently, Mayer, Heiser and Lonn (2001) conducted a series of four experiments which differed from Harp and Mayer's (1997; 1998) experiments mainly through computerized presentation of material. College students watched an animated multimedia explanation of the formation of lightning on a computer screen. Of particular interest, the addition of both videoed and narrated interesting but irrelevant material adversely affected students' understanding of the multimedia presentation as reflected in poorer recall and problem solving. Mayer, et al. (2001, p. 196) suggested that the coherence principle can be extended to computer-based materials: "Students understand a multimedia explanation more deeply when interesting but conceptually irrelevant video and narration are excluded rather than included."

In conclusion, a considerable body of research indicates that seductive details impede learning: "Novel, active, concrete, and personally involving details are highly memorable to readers. General, abstract, and structurally important ideas are remembered less well" (Garner et al., 1992). The seductive details effect occurs: 1) in children (Garner et al., 1989; Hidi et al., 1982), high-ability college students (Garner et al., 1989), and low-ability college students (Garner et al., 1992); 2) when seductive details are added that either do not support or somewhat support structurally important text ideas (Garner et al., 1989; 1991); and 3) when seductive details are either unsystematically inserted into a text passage (Hidi et al., 1982) or separated from paragraphs presenting structurally important information (Garner et al., 1991).

Criticisms and Negative Findings

Although the previously discussed studies seem to provide convincing evidence for a seductive details effect, some researchers disagree (Goetz & Sadoski, 1995a, 1995b; Schraw, 1998). For instance, Schraw (1998) had introductory-psychology students read a 2,100-word biography of Horatio Nelson and then recall as much and as accurately as they could. Seductive details were recalled better than were main text ideas. However, recall of seductive details was correlated with overall recall contrary to a seductive details effect, which should have been reflected in a negative relationship between recall of seductive details and other text segments. Further, a later study compared two versions of the same passage, one of which contained seductive details. The seductive details did not adversely affect recall of other information, especially main ideas.

In reviews of the seductive details literature Goetz and Sadoski (1995a, 1995b) concluded that although the research has provided information on the role of interest in learning, it does not consistently support a seductive details effect for several reasons: 1) The literature is replete with failed replications of previous findings; 2) Seductive details are generally not adequately defined operationally; 3) Many studies produce text with seductive details by adding information, resulting in a confounding presence of seductive details with overall text length; 4) Addition of seductive details that do not fit the idea hierarchy of the original text may disrupt passage coherence; and 5) Common use of inherently interesting passages is inconsistent with Garner and Gillingham's (1991) original assertion that a seductive details effect occurs when interesting but irrelevant seductive details are added to uninteresting text passages.

However, some researchers who have found seductive details effects claim that Goetz and Sadoski's (1995a, 1995b) criticisms are unfounded. For instance, Wade, Alexander, Schraw, & Kulikowich (1995) argue that Goetz and Sadoski failed to present some evidence that supports a seductive details effect, and that many of the criticisms cited by Goetz & Sadoski do not apply to seductive details research as a whole. Additionally, Wade et al. (1995) argue that Goetz and Sadoski's (1995a) criticism that certain studies did not experimentally manipulate seductive details was directed at studies that were not designed for this purpose. Obviously, controversy exists regarding the existence and/or importance of a seductive details effect.

Boxed Material: Seductive Detail, Apparently Irrelevant Facts, or Regular Text?

The seductive details effect has been demonstrated primarily using illustrations and extraneous or seductive text material, as described above. However, the effect of another potentially seductive detail, boxed material, on reading comprehension and retention has yet to be examined. One purpose of the present study was to examine the effects of boxed materials. Whether boxed material will act as a seductive detail, drawing attention from more important information and decreasing understanding and learning of more important material, is unknown. The effects of these materials will likely be related to readers' varying reinforcement histories. Readers who have not been reinforced for reading boxed material may well essentially ignore such material, whereas those who have been reinforced for reading boxed material will presumably read and attempt to learn the material. The effect of these contrasting tendencies could result in a bimodal distribution of scores on a recall test of boxed material. Generally, however,

seductive details or any material that distracts from main ideas should differentially interfere with performance of impaired readers who often have attentional deficits.

Attention Deficit-Hyperactivity Disorder

Attention deficit-hyperactivity disorder (ADHD) is a heterogeneous disorder of unknown etiology (APA, 2000; Gainetdinov, Wetsel, Jones, Levin, Jaber, & Caron, 1999). Its associated disabilities in children, adolescents, and adults make it a major clinical and public health problem in the United States (Spencer, Biederman, Wilens, Harding, O'Donnell, & Griffen, 1996).

Characteristics and Symptoms

ADHD generally begins in childhood when affected children characteristically exhibit chronic and pervasive problems with inattention, hyperactivity, and impulsivity (American Psychological Association, 1994). DSM-IV-TR diagnostic criteria for ADHD are summarized in Tables 1 and 2.

Table 1: DSM-IV-TR Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder

The following symptoms must be present to obtain the diagnosis of ADHD:

A. Either (1) or (2):
   1. Six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

      Inattention

      a. often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
      b. often has difficulty sustaining attention in tasks or play activities
      c. often does not seem to listen when spoken to directly
      d. often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
      e. often has difficulty organizing tasks and activities
      f. often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
      g. often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
      h. is often easily distracted by extraneous stimuli
      i. is often forgetful in daily activities

   2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

      Hyperactivity

      a. often fidgets with hands or feet or squirms in seat
      b. often leaves seat in classroom or in other situations in which remaining seated is expected
      c. often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
      d. often has difficulty playing or engaging in leisure activities quietly
      e. is often "on the go" or often acts as if "driven by a motor"
      f. often talks excessively

      Impulsivity

      g. often blurts out answers before questions have been completed
      h. often has difficulty awaiting turn
      i. often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder, and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

(APA, 2000, p. 92-93).

Table 2: DSM-IV-TR Criteria for Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified

Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified:

This category is for disorders with prominent symptoms of inattention or hyperactivity-impulsivity that do not meet criteria for Attention-Deficit/Hyperactivity Disorder.

1. Individuals whose symptoms and impairment meet the criteria for Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type but whose age at onset is 7 years or after.

2. Individuals with clinically significant impairment who present with inattention and whose symptom pattern does not meet the full criteria for the disorder but have a behavioral pattern marked by sluggishness, daydreaming, and hypoactivity.

(APA, 2000, p. 93).

ADHD is manifested in maladaptive and developmentally inappropriate behaviors that often interfere with a child's social and cognitive functioning (Rappley, 2005; Rapport, Loo, Isaacs, Goya, Denney, & Scanlan, 1996). Although such behaviors are common in children to a certain degree, ADHD children are characterized by "the intensity, the persistence, and the patterning of these symptoms" (Wender, 1987, p. 6). ADHD affects three to seven percent of school-aged children (APA, 2000; Rappley, 2005), with some estimates as high as eleven percent (Wender, 1997; Zametkin & Ernst, 1999). It persists into adolescence and adulthood in some 50 to 60 percent of cases (Barkley, 1990; Barkley & Biederman, 1997; Spencer et al., 1996; Wender, 1987, 1995, & 1997) or approximately 4% of adults worldwide (Wilens, Faraone, & Biederman, 2004).

Causes and Physiological Correlates of ADHD

Even today, when a plethora of research exists on ADHD, its underlying causes remain unclear. However, evidence supports several theories and physiological correlates of ADHD as well as an overall genetic component in the transmission of ADHD.

Executive Functioning Theories of ADHD

Executive functions (EFs) are complex constructs "that can be broadly defined as higher order cognitive abilities that allow for strategic planning, cognitive flexibility, self-regulation, and goal-directed behavior" (Weyandt, 2005, p. 1). EFs include "components of attention, reasoning, planning, inhibition, set-shifting, interference control, and working memory" (Biederman, Monuteaux, Doyle, Seidman, Wilens, Ferrero, Morgan & Faraone, 2004, p. 757). Consistent with executive functioning

theories of ADHD, such as the frontal lobe and working memory theories, several studies have documented that ADHD children have difficulties with aspects of executive functioning such as "response inhibition, poor sustained attention, response perseveration, nonverbal and verbal working memory, planning, sense of time, emotion regulation, and to a lesser extent, tasks involving verbal and nonverbal fluency" (Fischer, Barkley, Smallish & Fletcher, 2005, p. 108; See Barkley, 1997 for a review).

The frontal lobes and prefrontal cortex of the brain appear primarily responsible for EFs (Weyandt, 2005). As a result, ADHD theories focusing on these areas can be classified as EF theories. One such theory focuses on the frontal lobes of the brain, especially the prefrontal regions (Aman, Roberts, & Pennington, 1998). These brain regions are thought to play a major role in supporting working memory and executive functions, such as planning and implementing goal-oriented strategies, controlling impulses, inhibiting prepotent responses, shifting and maintaining strategy sets, and organizing and implementing search strategies (Aman et al., 1998). The frontal lobe theory of ADHD developed in the 1930's when practitioners and investigators noted the behavioral similarities between patients with frontal lobe lesions and children with ADHD symptoms. Both groups exhibited impaired response inhibition, excessive restlessness and distractibility, and inattention (Aman et al., 1998). Recent MRI studies have found that unlike non-ADHD children whose frontal regions are asymmetrical, with the left anterior region being smaller than the right, ADHD children appear to have symmetrical regions (Aman et al., 1998).

The working memory EF theory of ADHD focuses on the prefrontal region's responsibility for working memory. For example, ADHD participants performed

significantly worse than control participants on a task requiring behavioral inhibition and working memory (Iskowitz, 1998). An imaging study found that: 1) Brain scans of men with ADHD showed more diffuse task-related neural activity than control subjects; and 2) Control Subjects showed elevated PET activation and rCBF (regional cerebral blood flow) in the frontal and temporal regions, whereas ADHD subjects showed elevated rCBF activity in non-frontal areas including those related to the visuo-spatial sketch-pad, such as the precuneus and occipital regions. The results suggest that we use two subsidiary processes of working memory, and that people with ADHD rely more on visual rather than auditory strategies to integrate information (Iskowitz, 1998). Unfortunately, the visual process is not as capable as is the auditory one, so those with ADHD do not optimally use the prefrontal cortex to allocate and organize information efficiently (Iskowitz, 1998). Other studies of children and adults with ADHD provide additional support for the theory that working memory is somehow implicated in the disorder (Stearns, Dunham, McIntosh, & Dean, 2004). However, no effective method using working memory in diagnosis is available (Stearns et al., 2004).

Right Parietal Lobe Theory

The parietal lobes are thought to be involved in the integration of sensory input from visual regions of the brain and other sensory areas. In addition, the posterior parietal cortex is essential for accurate visually guided motor activity, spatial perception, and spatial attention (Aman et al., 1998). The right parietal lobe theory of ADHD was introduced by investigators who observed that the attentional deficits and hypo-arousal often observed in ADHD children are similar to behavioral symptoms observed in individuals with right parietal lobe damage (Aman et al., 1998). Neuropsychological

evidence implicating the right parietal lobe in ADHD can be found in Letter Cancellation Task results, which show that ADHD children make significantly more errors of omission and more left-sided errors than non-ADHD children. ADHD children also perform poorly on mental rotation tasks, and their performances resemble those of patients who have sustained right parietal lobe damage (Aman et al., 1998). Generally, however, less evidence supports the right parietal lobe theory of ADHD than the Frontal Lobe Theory (Aman et al., 1998).

Dopamine Hypothesis

The dopamine (DA) hypothesis asserts that dopamine underactivity is at least partly responsible for ADHD symptoms (Riccio, Hynd, Cohen, & Gonzalez, 1993; Wender, 1997). Underactivity of dopamine may decrease the body's ability to appropriately regulate multiple behaviors including inhibition, motivation, attention, and responses of the motor system. The effects of stimulant medications such as methylphenidate and dextroamphetamine on people with ADHD supports a role of dopamine in ADHD since these drugs are indirect dopamine agonists that increase the amount of dopamine available in the brain (Wender, 1997) and improve many characteristic ADHD behaviors (Rapport et al., 1996). In fact, Russell, de Villiers, Sagvolden, Lamm, and Taljaard (1998) proposed a dopamine underactivity animal model of ADHD based on genetically engineered rats that have impaired vesicular storage of DA that results in DA leakages into the cytoplasm. These rats, dubbed "spontaneously hypertensive" (SHR) rats, released less DA from vesicular stores in response to methylphenidate (MPH) and more DA from cytoplasmic stores in response to dextroamphetamine (d-AMP) (Russell et al., 1998).

Overall Genetic Component of ADHD

Research indicates that there is a genetic component in the transmission of ADHD (e.g., Rappley, 2005; Solanto, 1998; Wender, 1997). Indeed, the "most common etiological factor in the development of ADHD is heredity, which is thought to account for cause in approximately 80% of the cases" (Stein, Efron, Schiff, & Glanzman, 2002). For instance, a higher incidence of ADHD and other psychiatric conditions occurs in first-degree biological relatives of children with the disorder (APA, 2000). Alcohol abuse and anti-social personality disorder are common in biological, but not adoptive, parents of individuals with ADHD (Wender, 1997). Of course, genetic factors are likely to play a role in any neurological explanation of ADHD.

A Unifying Theory of ADHD

One unifying theory of ADHD that encompasses aspects of various techniques and theories postulates that the essential impairment in ADHD is a deficit in response inhibition (Barkley, 1997). Such deficits lead to secondary impairments in executive functions such as: working memory, self-regulation of affect-motivation-arousal, internalization of speech, and behavioral analysis and synthesis. The secondary impairments then lead to decreased motor control which ultimately leads to the appearance of poor sustained attention in persons with ADHD. However, Barkley (1997) notes that this inattention actually represents a decrease in control of behavior by internal rules and information from executive functions. Deficits in behavioral inhibition impair three interrelated processes: (a) inhibition of an initial response to an event; (b) stopping an ongoing response, thus permitting a delay in the decision to respond; and (c)

protection of this period of delay from disruption by competing events and responses (i.e., interference control).

Treatments

Although a variety of ADHD treatments exist, including educational interventions, social-skills training, and individual counseling (Barkley, 1990; Zametkin & Ernst, 1999), medication and behavioral interventions are considered to be the most effective forms of treatment (Rapport et al., 1996). Some (e.g., Wender, 1997) suggest that the ideal treatment for ADHD involves pairing medication with behavioral interventions such as study skills training (Benz, Fabian, & Nelson, 1996) or psychosocial treatment (Arnold et al., 1997). Stimulant medication is the most established treatment for ADHD (Patrick & Markowitz, 1997) its use is supported by extensive research demonstrating behavioral and cognitive improvements in a number of situations (McClellan & Werry, 2003; Rapport et al., 1996).

Stimulant Medications

"The effectiveness of stimulants for the short-term treatment of attention-deficit/hyperactivity disorder (ADHD) is well documented and constitutes the largest body of evidential literature in child psychiatry pharmacology" (McClellan & Werry, 2003, p. 1389). Stimulant medications have been used to treat ADHD for more than 60 years. Four immediate-release stimulant drugs are now marketed: methylphenidate (MPH) [Ritalin], Dextroamphetamine (d-AMP) [Dexedrine], Adderall, and pemoline (PEM) (Greenhill, Halperin, & Abikoff, 1999). In addition, slow-release stimulant medications, such as Concerta and Adderall XR, as well as non-stimulant medications, such as atomoxetine [Strattera] and buproprion [Wellbutrin], have shown effectiveness

for the treatment of ADHD in some individuals (McClellan & Werry, 2003; Rappley, 2005).

Of the over four million children in the United States who sought outpatient treatment for ADHD in 1993, 90% were collectively prescribed one of the four immediate release stimulant medications listed above (Greenhill, Halperin, & Abikoff, 1999). These drugs improve classroom manageability and attention in terms of time on task (Swanson, Cantwell, Lerner, McBurnett, & Hanna, 1991). In addition, studies also "consistently noted a positive response for core ADHD symptoms, and some reported improved compliance and reduced aggression" (McClellan & Werry, 2003, p. 1389). MPH (Ritalin) is the most often prescribed, with in excess of 10 million prescriptions written in 1996 alone (Greenhill, Halperin, & Abikoff, 1999), and accounts for 70%-90% of ADHD drug therapy (Patrick & Markowitz, 1997). Evidence also supports, however, either MPH (Ritalin) or d-AMP (Dexedrine) as a first choice medication because "70 to 80 percent of children show improved attention with the use of one or the other" (Rappley, 2005, p. 167).

Effects of Stimulant Medications

Clinical and pharmacological research indicates that stimulant medications not only decrease abnormal behaviors associated with ADHD, but also improve self-esteem, cognition, and social and family functioning in a dose-dependent and cross-situational manner (Spencer et al., 1996). Table 3 lists examples of typical behavioral and academic improvements resulting from stimulant medications.

Table 3: Expected Effects of Stimulant Medication for the Treatment of ADHD

Areas of Expected Improvements from the use of Stimulant Medications*
Temper
Mood lability
Disorganization
Stress Sensitivity (Wender, 1997)
Attention span
Compliance
Impulsivity and self-control
Overactivity / Hyperactivity
Physical and verbal aggression
Social Interactions with peers, teachers, and parents
Academic productivity and accuracy (Swanson et al., 1993)

Areas in which Improvements are Not Expected from the use of Stimulant Medications
Long-term Adjustment
Absence of side effects
Large effects on skills or higher order processes: (i.e., reading skills, athletic or game skills)
Paradoxical Responses: (i.e., differing responses between "normal" and ADHD individuals)

* Some improvements in learning/achievement have been noted, but they are typically not as dramatic as are improvements in behavior/attention (Swanson et al., 1993; Zametkin & Ernst, 1999).

Stimulant medications also improve academic performance in children with ADHD on tasks designed to resemble classroom assignments (Olfson, Gameroff, Marcus, & Jensen, 2003; Swanson et al., 1991) and improve behavioral symptoms of ADHD when compared with placebos, other drug classes, or non-pharmacological treatments (Greenhill, Halperin, &Abikoff, 1999; Spencer et al., 1996; Zametkin & Ernst, 1999). Yet, such improvements in academic performance could be due to a medication-induced improvement in memory, which is supported by compelling evidence that d-AMP "facilitates memory consolidation processes even in the absence of direct effects on initial acquisition" (Solanto, 1998, p. 137). However, one of the most impressive findings regarding the effects of stimulants is that medication effects persist over time, as long as 12-24 months after medication therapy (Greenhill, Halperin, & Abikoff, 1999). This finding is consistent with findings that indicate that "for children with ADD but without concurrent academic problems, stimulant medication clearly increases practice to a degree that should improve learning" (Swanson et al., 1993, p. 160). Thus, these medications help maintain improvement in ADHD symptoms.

Learning and School-Based Deficits Resulting from ADHD

The relationship between ADHD and academic underachievement is well documented (Barkley, 1990; Marshall & Hynd, 1997): Children with ADHD are likely to be behind non-diagnosed siblings and other normal children in both intellectual development (Barkley, 1990) and academic achievement (Reid, 1999). ADHD children, like normal children, are likely to represent the entire spectrum of intelligence, from gifted down to retarded (Barkley, 1990; Wender, 1987), but underachieve relative to their intelligence (Barkley, 1990). They are also more likely to show uneven intellectual

development and display large differences across areas of intelligence such as reading, memory, arithmetic, understanding, vocabulary, spelling, and problem solving (Marshall & Hynd, 1997; Wender, 1987).

Children and adults with ADHD are also likely to show deficits in organizational skills and complex problem-solving strategies (Barkley, 1990). These difficulties do not stem from memory problems or lack of ability to apply skills or strategies to certain tasks, but originate from either a lack of effort in applying a given executive strategy or the use of an inefficient strategy (Barkley, 1990). As a result, ADHD children are often impulsive in the way they apply their own strategies, which are generally poorly organized and inefficient, as well as less efficient at communicating these strategies to others (Barkley, 1990).

Children and adolescents with ADHD also commonly show deficits in reading comprehension (Ghelani, Sidhu, Jain & Tannock, 2004), as do children with learning disabilities (LD). The disorders are often co-morbid, and research on those who have both ADHD and LD will follow a description of LDs themselves.

Learning Disabilities

Reading Disorder, Mathematics Disorder, Disorder of Written Expression, and Learning Disorder Not Otherwise Specified are four types of Learning Disorders or Disabilities (LD) (APA, 2000). Formerly known as Academic Skills Disorders, LDs are common in the United States, with prevalence estimates ranging from two to ten percent of the general population and approximately five percent of students in U.S. public schools (APA, 2000).

Symptoms and Characteristics

Learning disorders are diagnosed when an "individual's achievement on individually administered, standardized tests in reading, mathematics, or written expression is substantially below that expected for age, schooling, and level of intelligence" (APA, 2000, p. 49). Generally speaking, "substantially below" is defined as a discrepancy of more than two standard deviations between IQ and achievement, and LDs must be distinguished from "normal variations in academic attainment and from scholastic difficulties due to lack of opportunity, poor teaching, or cultural factors" (APA, 2000, p. 51). Furthermore, LD should be diagnosed in conjunction with impaired vision or hearing only if the learning difficulties are in excess of those generally associated with these deficits. Lastly, diagnosis of an additional LD should be made in the context of a pervasive developmental disorder only if academic impairment is significantly below levels expected given the person's schooling and intellectual functioning (APA, 2000).

Learning disorders interfere with academic achievement or activities of daily living that involve writing, mathematical, or reading skills (APA, 2000). In addition, individuals with LDs frequently suffer from low self-esteem, demoralization, deficits in social skills, and developmental delays in language (APA, 2000). Likely related to a genetic predisposition, learning disorders create problems for children and adults alike. For instance, the school drop-out rate for children or adolescents with LDs is approximately 1.5 times the average, and adults with LDs frequently have increased difficulties in employment or social adjustment (APA, 2000).

Specific Learning Disorders and Resulting Learning and School-Based Deficits

Each individual learning disorder is associated with certain learning and school-based deficits, as well as self-esteem and social skills deficits. Mathematics Disorder and Disorder of Written Expression rarely exist in the absence of Reading Disorder (APA, 2000).

Reading Disability

Reading disability (RD) is characterized by disturbances in reading that significantly interfere with academic achievement or daily activities requiring reading skills. DSM-IV-TR diagnostic criteria for reading disability are summarized in Table 4. In addition, reading disability is found more often in males, with 60 to 80 percent of individuals diagnosed with the disorder being male (APA, 2000). However, referral and diagnostic procedures may be biased toward identifying males, since the disorder occurs almost equally in both genders when stringent criteria and careful diagnostic methods are used (APA, 2000). Reading disability is estimated to occur in four percent of school-aged children in the United States and aggregates in families, with higher prevalence rates among first-degree biological relatives of persons with a diagnosed learning disability (APA, 2000). Reading disability is rarely diagnosed before the end of kindergarten or the beginning of first grade and may persist into adulthood (APA, 2000).

Table 4: DSM-IV-TR Diagnostic Criteria for Reading Disorder

A. Reading achievement, as measured by individually administered standardized tests of reading accuracy or comprehension, is substantially below that expected given the person's chronological age, measured intelligence, and age appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require reading skills.

C. If a sensory deficit is present, the reading difficulties are in excess of those usually associated with it.

(APA, 2000, p. 53)

Mathematics Disorder

Mathematics disorder is characterized by disturbances in mathematics that significantly interfere with academic achievement or daily activities that require mathematical skills. Its DSM-IV-TR diagnostic criteria are summarized in Table 5. Estimates suggest that 1 percent of school-age children in the United States have Mathematics Disorder, which is usually diagnosed during second or third grade (APA, 2000).

Table 5: DSM-IV-TR Diagnostic Criteria for Mathematics Disorder

A. Mathematical ability, as measured by individually administered standardized tests, is substantially below that expected given the person's chronological age, measured intelligence, and age-appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require mathematical ability.

C. If a sensory deficit is present, the difficulties in mathematical ability are in excess of those usually associated with it.

(APA, 2000, p. 54)

Disorder of Written Expression

Disorder of written expression is characterized by disturbances in written expression that significantly interfere with academic achievement or daily activities that require writing skills. Its DSM-IV-TR diagnostic criteria are summarized in Table 6. Disorder of written expression is rare in the absence of other learning disorders, and with the exception of spelling tests, standardized tests in this area are less developed than tests for reading or mathematical ability (APA, 2000). The evaluation of impairment in written skills may require comparisons between written schoolwork samples and expected performance for age and IQ (APA, 2000). Lastly, if an individual is affected by a disorder in spelling or handwriting alone, without other difficulties of written expression, diagnosis of disorder of written expression is usually not given. Instead, if poor handwriting is a result of impairment in motor coordination, diagnosis of developmental coordination disorder should be considered (APA, 2000).

Table 6: DMS-IV-TR Diagnostic Criteria for Disorder of Written Expression

A. Writing skills, as measured by individually administered standardized tests (or functional assessments of writing skills), are substantially below those expected given the person's chronological age, measured intelligence, and age-appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require the composition of written texts (e.g., writing grammatically correct sentences and organized paragraphs).

C. If a sensory deficit is present, the difficulties in writing skills are in excess of those usually associated with it.

(APA, 2000, p. 56)

Learning Disorder Not Otherwise Specified

Learning disorder not otherwise specified (NOS) is the diagnosis given for a category of disorders in learning that do not meet criteria for a specific learning disorder. A person with learning disorder NOS may have relatively minor problems in all three areas that, when combined, significantly interfere with academic achievement. In this case, a diagnosis of learning disorder NOS may be made even though performance on tests measuring each individual skill is not significantly below that which would be expected given the person's age-appropriate education, chronological age, and measured intelligence (APA, 2000).

Co-morbidity of ADHD and LD

ADHD and LD frequently co-occur (Barkley, 1990; Marshall & Hynd, 1997; Marshall, Schafer, O'Donnell, Elliott, & Handwerk, 1999; Maynard et al., 1999), with estimates of co-morbidity ranging from approximately 20 to 50 percent, depending on the way learning disability is defined or ADHD is assessed (Maynard et al., 1999). No consensus exists as to the basis of this correlation (Maynard et al., 1999). For instance, attention variables do not predict reading achievement, but cognitive tasks that generally predict reading disability are also deficient in persons with ADHD (Maynard et al., 1999). Examples of these tasks include naming, perceptual speed, and speed of cognitive processing, each of which is deficient in both disorders. In addition, similar to individuals with reading disorders, children with ADHD may have linguistic deficiencies or phonological processing deficits predictive of reading disabilities, and language impairment may be the strongest cause of reading problems in persons with ADHD (Maynard, Tyler, and Arnold, 1999). A frequently mentioned possible cause of the co-

morbidity is the fact that low academic achievement results from the impulsivity, hyperactivity, attention problems, and cognitive deficits inherent in ADHD (Maynard et al., 1999).

Reading Comprehension, Reading Disabilities, and ADHD

Students with reading or learning disabilities are at risk for problems involving fluency, which has been linked to successful reading in countless studies and over many years (Chard, Vaughn & Tyler, 2002). Furthermore, reading comprehension difficulties occur in persons with RD, ADHD, and both disorders. For instance, Ghelani et al. (2004) found that adolescents with RD only showed difficulties across most reading tasks but had average comprehension scores, whereas adolescents with ADHD exhibited adequate single word reading abilities but showed subtle differences on and scored in the average range for text reading rate and accuracy and silent comprehension. Ghelani, et al. (2004) also found that a group of adolescents co-morbid for RD and ADHD demonstrated difficulties on word reading accuracy and reading rate similar to those exhibited by adolescents with RD only, but experienced problems only on silent reading comprehension. Unfortunately, however, "[t]he nature of reading comprehension difficulties in these groups remains unclear" (Ghelani et al., 2004, p. 364) due to a lack of coherent research on the topic.

ADHD and LD: Implications for a Seductive Details Effect

Apparently no research on seductive details has used reading impaired participants. Since those with ADHD and LD commonly suffer from reading deficits, a particularly large seductive details effect might occur in affected individuals. Those with ADHD often have difficulty sustaining attention and are often easily distracted by

extraneous stimuli, potentially leading to increased attention to seductive details. Similarly, those with LD generally have difficulty reading and comprehending text under the best of conditions, and might also be particularly affected by seductive details.

Many of the published techniques used to insert extraneous information or seductive details into textbooks distract students from more important information (Harp & Mayer, 1997), but are not intended to function as pedagogical aids. However, extraneous material in actual texts is generally intended to assist readers, but may actually distract them. The role of such pedagogical aids is not known. Further, previous studies, have not manipulated "boxed" material that is commonly present in textbooks. What effect do these types of material have on comprehension of the main ideas in text passages? Do they function as pedagogical aids or as distractions? The purpose of this experiment was to study the effect of seductive details, broadly defined to include "boxed material," on both normal readers and those with ADHD and/or LD.

Definition of Seductive Details

In the present study, "seductive details" was defined as any extraneous material added to a passage to make it more interesting or any information that had been physically set off from the main prose passage, as in a box. For example, definitions in bold letters within the text or in text margins were not considered extraneous material, but "focus" questions in the margins were. Such questions do not add new information or clarify the passage, and are possible sources of distraction. Illustrations unrelated to the text or uncaptioned were also considered seductive, whereas illustrations with captions and referred to in the text were not. Lastly, case studies, stories, and other examples used

to illustrate points in the text were deemed extraneous if they were set apart from the general prose text, such as in a box, or if they did not clarify text information.

Present Study

Participants with and without ADHD and/or LD read one of two versions of a text passage entitled "People with Severe and Multiple Disabilities." The "Original" text version contained extraneous information and illustrations, set apart from the rest of the text, as they appear in the textbook Human Exceptionality: Society, School, and Family (Hardman, Drew, & Egan, 1999). The "Modified" text version presented boxed information imbedded in the text and omitted illustrations and "Focus" questions from the margins. Participants then completed, in order, the Wender Utah Rating Scale (WURS), Beck Depression Inventory (BDI), a Health History Questionnaire, a 45-question multiple choice quiz on the passage material, and a post-study questionnaire.

Predictions

Hypothesis I

A main effect of version was expected such that participants would do better on the modified version than the original version.

Hypothesis II

A main effect of group was also expected such that, on average, NC participants would do better than AD participants.

Hypothesis III

A main effect of type of recall stem was also expected such that participants would do better on questions regarding text information than on questions regarding boxed information.

Hypothesis IV

Lastly, a differential effect of seductive details on participants with ADHD and/or other types of learning disorders was predicted such that AD participants would do differentially worse on the original version than on the modified version than would NC participants.

Uncertain Predictions

It was unknown whether boxed material would act as a seductive detail and draw readers' attention away from more important information in the text, therefore decreasing students' understanding and learning of more important material. One reason for uncertainty was the expectation that the effects of boxed material would be related to readers' variable past experiences and reinforcement histories. Students not previously rewarded for reading boxed material might not read it and therefore not perform well on recall test questions for that material. Students previously reinforced for reading boxed material would be more likely to read it and perform well on those recall questions. These conflicting and unknown tendencies made predictions unclear.

METHOD

Design

The present experiment used a 2 [Version: Original Text (OT) vs. Modified Text (MT)] x 2 [Group: Normal Controls (NC) vs. Readers with Attentional Deficits (AD)] x 2 [Type of Recall Stem: Box Information (BI) vs. Text Information (TI)] mixed factorial design. Version and group were between-subject factors; type of recall stem was a within-subject factor.

Overview of Procedure

Materials consisted of the following: a) an initial set of standard scales and a personal history inventory; b) original and modified text material; c) a reading comprehension quiz on the text material; and 4) two survey questionnaires requesting information on how participants generally read textbook assignments. All participants completed both the survey items and the experiment. Criteria described below were used to identify the final sample of NC and AD participants.

Participants

Participants in the initial pool were 130 UNCW undergraduate general psychology students and Wilmington and Raleigh area residents. General psychology students were selected from an initial pool of students who completed the Wender Utah Rating Scale (WURS) (Ward et al., 1993; Wender, 1995). Participants were also solicited by means of fliers posted in Wilmington and Raleigh (See Appendixes A and B) and fliers distributed by local psychologists (See Appendix C). All students volunteered for the study and UNCW general psychology students received one unit of research credit for participating.

Participants in the initial pool ranged in age from 18.0 to 27.2 years with a mean of 19.3 years and a mode of 18.7 years. Year in college and gender are shown in Tables 7 and 8.

All 130 participants completed the study, and their responses to initial survey items are reported. The number of participants used in analysis of the recall test in the experiment was reduced to 39 (NC=18; AD=21) using the methods and standard instruments described below.

Table 7: Year in College Distribution

Year in College	Frequency	Percent (%)
Freshman	87	66.9
Sophomore	30	23.1
Junior	7	5.4
Senior	6	4.6
Total	130	100.0

Table 8: Gender Distribution

Gender	Frequency	Percent (%)
Male	39	30.0
Female	91	70.0
Total	130	100.0

Materials

Survey Instruments

Informed Consent Form

All participants were first instructed to sign an informed consent form (See Appendix D) stating the purpose of the research, describing the method of the experiment, and assuring the confidentiality of all participant information.

Wender Utah Rating Scale

The Wender Utah Rating Scale (WURS) (See Appendix E) is a 61 question "rationally constructed retrospective self-report scale" (Rossini & O'Connor, 1995, p. 751) on which adults describe specified childhood behaviors (Ward et al., 1993; Wender, 1995). This scale and its 25 question short form are used primarily as aids in the retrospective diagnosis of childhood ADHD in adults. Responses are on a 5 point Likert-type scale. Its reliability and validity as a diagnostic instrument for ADHD are empirically supported (e. g., Rossini & O'Connor, 1995; Samuelsson, Lundbert & Herkner, 2004; Stein et al., 1995; Ward et al., 1993). In fact, studies have ranked the WURS as among the most discriminating psychometric measures of ADHD (See Roy-Byrne, Scheele, Brinkley, Ward, Wiatrak, Russo, Townes & Varley, 1997; Wodushek & Neumann, 2003). Relatively high WURS scores indicate that a participant exhibited more symptoms characteristic of ADHD as a child than did participants with relatively low WURS scores (Ward et al., 1993). Scores in the middle of the WURS distribution are not generally seen as indicative of normal responding because scores of ADHD and depressed participants overlap in this range (Ward et al., 1993).

Beck Depression Inventory

The Beck Depression Inventory (BDI) (See Appendix F) is a 21-item paper and pencil scale with scores that range from zero to 62. Items are weighted according to the degree to which they indicate severity of depression. It is a widely used scale with established psychometric properties (e.g., Spencer, Wilens, Biederman, Faraone, Ablon, Lapey, 1995). For precautionary purposes, the item from the original BDI that dealt with "Self-punitive Wishes" or suicide (Beck et al., 1961) was omitted from the BDI used in this study. This omission was appropriate because the BDI was used for classification, not diagnosis. The omission of this item prevented a situation in which the experimenters could have faced an ethical and legal dilemma involving participant confidentiality. Thus, the BDI used in this study had 20 items with a maximum score of 59.

Personal History Questionnaire

Created by the author, the personal history questionnaire (See Appendix G) asked subjects about: a) demographic characteristics, such as age and gender; b) visual deficits; c) current medications in order to screen for stimulant medications and other drugs commonly used in the treatment of ADHD; and d) diagnosis with any of the following psychological disorders: Bi-Polar Disorder/Depression, Schizophrenia, ADHD or ADD, Obsessive Compulsive Disorder (OCD), and/or Learning Disability (LD).

Experimental Materials

Text Passages

Students read one of two versions of a text passage entitled "People with Severe and Multiple Disabilities" (See Appendices H & I). The Original Text (OT) text version contained boxed or extraneous information and illustrations, set apart from the rest of the

text, as they appeared in the textbook Human Exceptionality: Society, School, and Family, 6th edition (Hardman, Drew, & Egan, 1999) (See Appendix H). The Modified Text (MT) version presented the boxed information imbedded in the text and omitted illustrations and "Focus" questions from the margins (See Appendix I). Text booklets were black and white copies of the full-color originals.

Reading Comprehension Quiz

The author-developed reading comprehension quiz (See Appendix J) consisted of 45 questions, nine of which tested for information in boxes (BI) in the original version and 36 of which tested for information in the text (TI) of the original version. Participants recorded answers on provided *Scantron* optically-scanned answer sheets.

Post-study Questionnaire

After completing the comprehension quiz, participants completed a post-study questionnaire specific to their version of the text passage (See Appendices K & L). The questionnaire used a 7 point Likert scale defined as follows: 1 = Extremely Clear or Always, 4 = Clear or Sometimes, and 7 = Extremely Unclear or Never. Participants were asked questions regarding classes they had taken and the way in which they read textbooks, including whether they usually read boxed material and, for participants who read the OT version (See Appendix K), whether they read the boxed material in the current passage. For participants who read the MT version (See Appendix L), the following question was omitted since the MT version contained no boxed material: "Did you read the information in the 2 boxes that were in the reading material?"

Evaluation Questionnaire

The evaluation questionnaire (See Appendix M), titled Pilot-Study Questionnaire in the study, asked students to rate the amount of reading time allotted, the clarity of the quiz questions, and if any questions were poorly worded.

Procedure

Procedure for Conducting an Experimental Session

The following procedure was used for all experimental sessions. Participants attended one session approximately 60 min long. After initially completing an informed consent form (See Appendix D), they were asked to indicate their preferred method of studying a textbook passage: a) Using a highlighter; b) Underlining; or c) Reading without marking. Participants who indicated preference for highlighting or underlining were provided with appropriate materials. The experimenter then read the following statement: "You have 20 minutes to read and study the following text excerpt as you would in preparation for a quiz or test. Please act as if you were studying for a test in a class that you were actually taking. You will then complete a written quiz on this material after you are done reading the excerpt." Participants were also told that they would not be allowed to move on to the next portion of the study until the full 20 min had elapsed, as timed by the experimenter. The 20 min time limit was selected on the basis of pilot-study data on the length of time students generally used to study passages of various lengths.

At the end of the 20 min study period, the experimenter instructed all participants to complete the WURS, personal history questionnaire, and BDI, and to complete the reading comprehension quiz on the *Scantron*. Participants were not allowed to begin

working on these materials until instructed by the experimenter, but once started they were allowed to work at their own pace. Lastly, the experimenter instructed participants to complete the post-study and pilot study questionnaires. The experimenter then thanked participants for their time and gave UNCW general psychology students credit slips.

Selection of Final Experimental Sample

The final sample for the experiment was selected on the basis of responses to the WURS, BDI, and personal history questionnaire.

Use of the WURS

WURS scores were distributed as shown in Figure 1. Participants who scored in the upper 15.4% (WURS $\geq$ 32) of the sample were defined as having characteristics similar to individuals with ADHD and were placed in the "Attentional Deficit" (AD) condition. Participants who scored in the lower 13.8% (WURS $\leq$ 4) of the sample were defined as having characteristics similar to "normal" (no attentional deficits) individuals and were placed in the "Normal Control" (NC) condition. Participants who scored in the middle of the WURS distribution were not placed into either group owing to uncertainty, as described above, about their characteristics. Additionally, five participants who self-identified on the personal history questionnaire as having a diagnosis of ADHD or LD were also placed in the "Attentional Deficit" (AD) condition. Of those five, one had been previously diagnosed with both ADHD and Dyslexia, one with both ADHD and an unspecified learning disorder (LD), and three with ADHD only.

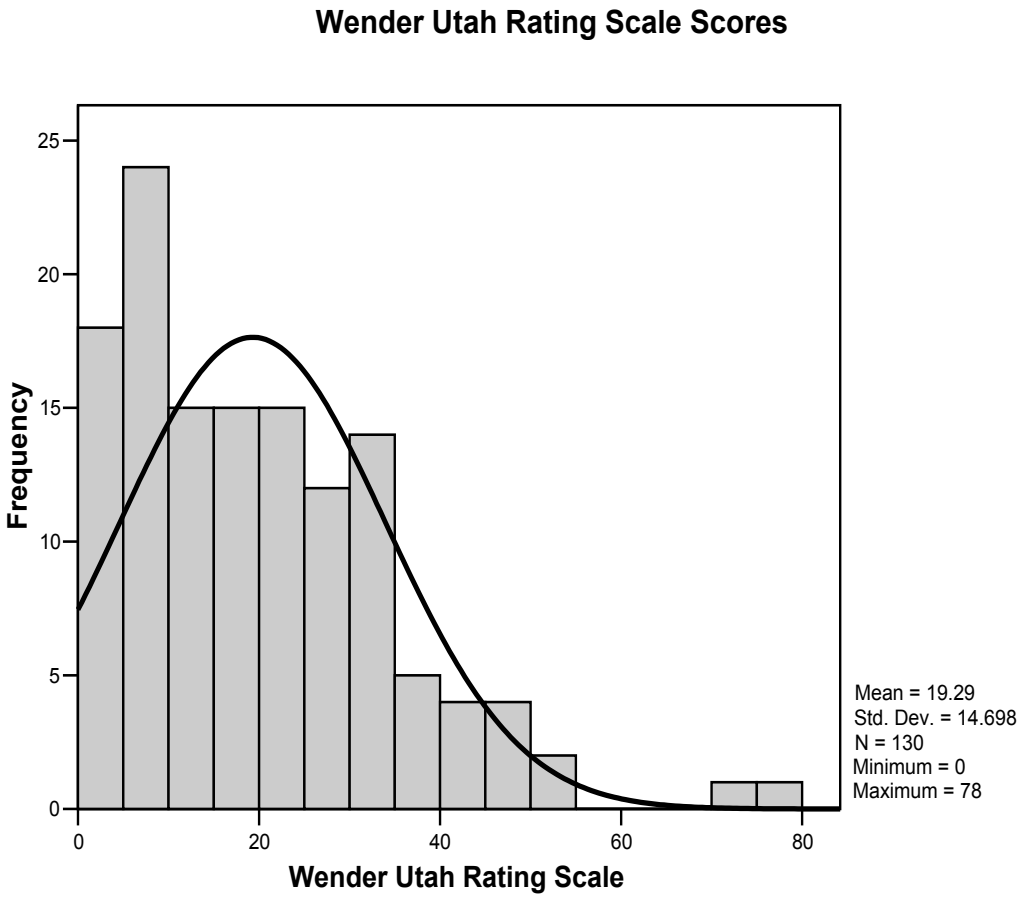

Figure 1. Wender Utah Rating Scale Scores

Use of BDI and Post-study Questionnaire

BDI scores were distributed as indicated in Figure 2. Nine participants with no previous diagnosis of ADHD and/or LD were initially excluded from the final sample based on BDI symptoms indicating severe anxiety or depression (BDI score $\geq$ 11) or self-identification on the personal history questionnaire as having a diagnosis of any disorder except ADHD and / or LD. The use of 11 as the BDI cutoff score was based on the mean scores for non-depressed participants in Beck et al. (1961) (Mean Study I = 11.3; Mean Study II = 10.3; Overall Mean = 10.9).

Participants with a previous diagnosis of ADHD and/or LD were initially excluded from the final sample if they had indicated a diagnosis of any psychological disorder other than ADHD or LD. Due to low participant turn-out, participants with both ADHD and bi-polar disorder or depression diagnoses were placed in the AD condition unless they were disqualified from participating by other factors. Inclusion of these participants did not contaminate the final sample because WURS scores were not used to select participants with a previous diagnosis of ADHD. Three such participants were included in the AD condition.

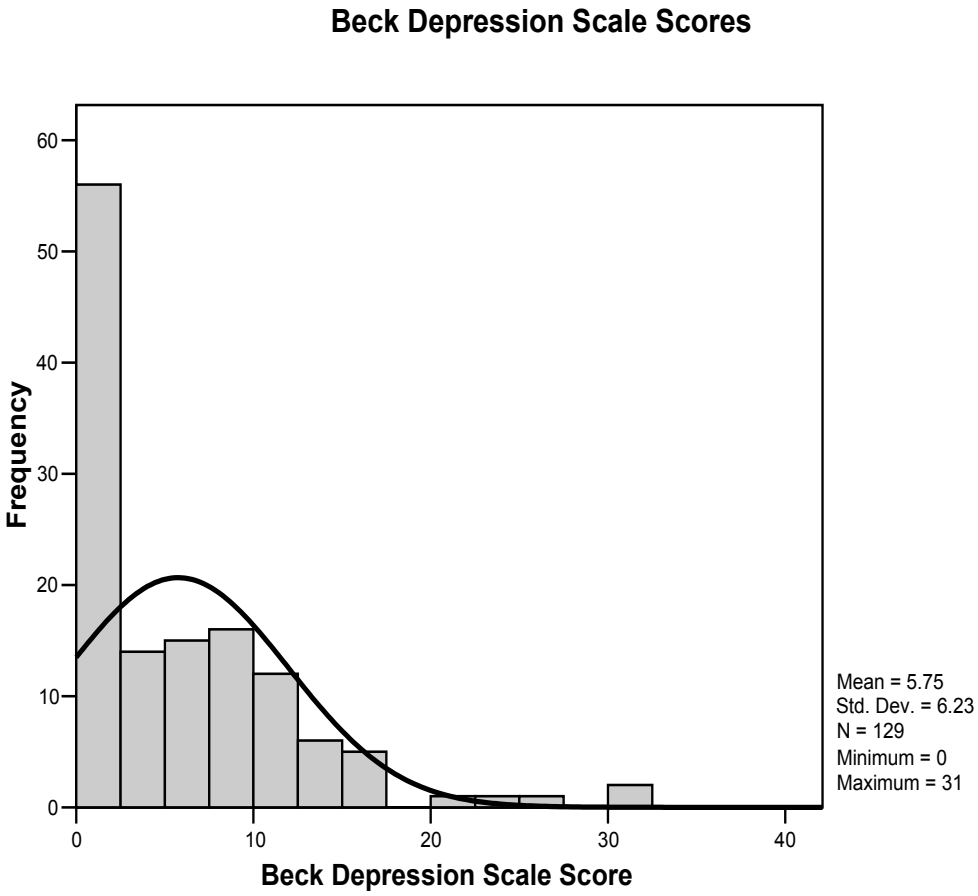

Figure 2. Beck Depression Scale Scores

In an effort to consistently include participants previously diagnosed with bi-polar disorder or depression in the final sample, four additional participants were included. Two scored equal to or greater than 11 on the BDI but had WURS scores sufficiently high to place them in the AD condition. Two participants scored less than 11 on the BDI but were included in the NC condition despite mid-range WURS scores. Thus, all subjects indicating a previous diagnosis of bi-polar disorder or depression were included in the study unless they were disqualified from participating by other factors.

The final sample for the experiment was 39 participants who were distributed as shown in Tables 9 and 10.

Table 9: Distribution of NC and AD Participants in Final Experimental Sample

Condition	Frequency	Percent (%)
NC	18	46.2
AD	21	53.8
Total	39	100.0

Table 10: Diagnosis Distribution for Final Experimental Sample

Diagnosis	Frequency	Percent (%)
None	23	59.0
Bi-Polar Disorder / Depression	4	10.3
ADHD	11	28.2
ADHD Only	6	15.4
ADHD & Bi-Polar Disorder / Depression	3	7.7
ADHD & Dyslexia	1	2.6
ADHD & Unspecified Learning Disorder	1	2.6
Total (Using Non-Rounded Percentages)	39	100

Statistical Analysis

All statistical tests were performed on PC SPSS version 12.0. All graphical representations of data were generated using either PC SPSS version 12.0 or Microsoft Excel. For all statistical comparisons, the type III sums of squares were generated. A major advantage of using type III sums of squares is that they are invariant with respect to cell frequencies. Type III sums of squares are therefore the preferred sums of squares type in analyses involving unequal n's. Because unequal n's were present in this study, the use of type III sums of squares was appropriate and all means reported were un-weighted.

Boxed Information (BI) scores from the reading comprehension quiz approximated a normal distribution (See Figure 3). As a result, text scores were analyzed as a 2 [Version: Original Text (OT) vs. Modified Text (MT)] x 2 [Group: Normal Controls (NC) vs. Readers with Attentional Deficits (AD)] x 2 [Type of Recall Stem: Box Information (BI) vs. Text Information (TI)] mixed ANOVA. Version and group are between-subject factors; type of recall stem is a within-subject factor.

Dependent variables in this experiment included boxed-information score (BI) and text-information score (TI). On the modified version of the text passage, BI score was based on answers to questions on information that appeared in boxes in the original version of the passage. For each measure, higher scores indicate better recall, and thus better performance. All Boxed Information and Text Information scores were analyzed using the percentage of such questions answered correctly on the reading comprehension quiz.

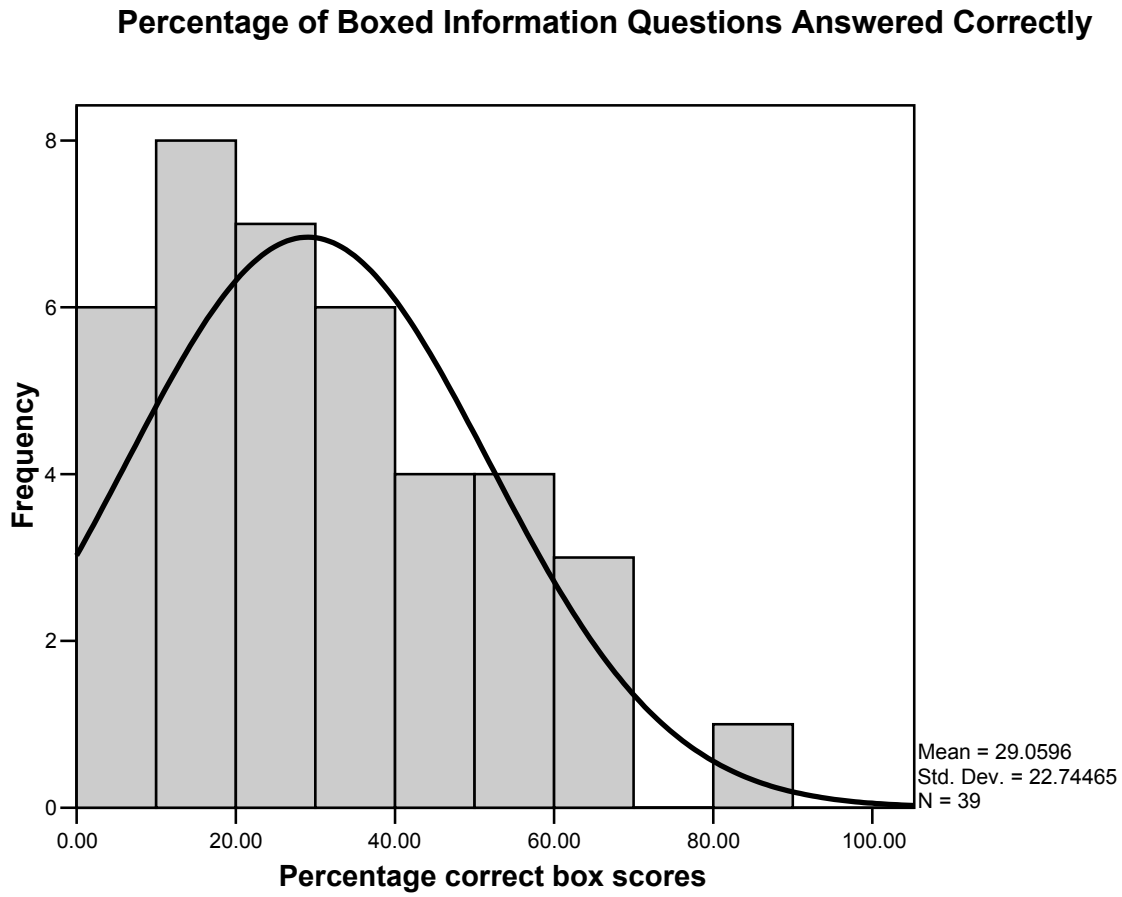

Figure 3. Percentage of Boxed Information Questions Answered Correctly

RESULTS

ANOVA Results

Results of the 2 [Version: Original Text (OT) vs. Modified Text (MT)] x 2 [Group: Normal Controls (NC) vs. Readers with Attentional Deficits (AD)] x 2 [Type of Recall Stem: Box Information (BI) vs. Text Information (TI)] ANOVA are summarized in Table 11.

Table 11: Tests of Between and Within-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Between-Subjects Effects:					
Version	162.960	1	162.960	.261	.612
Group	1967.080	1	1967.080	3.155	.084
Version x Group	38.106	1	38.106	.061	.806
Between Subjects Error	21819.832	35	623.424		
Within-Subjects Effects:					
Type of Recall Stem	4316.042	1	4316.042	27.367	.000
Type of Recall Stem x Version	141.276	1	141.276	.896	.350
Type of Recall Stem x Group	83.833	1	83.833	.532	.471
Type of Recall Stem x Version x Group	41.621	1	41.621	.264	.611
Within-Subjects Error	5519.801	35	157.709		

As is illustrated in table 11, a main effect of type of recall stem, F (1,35) = 27.37, p <.001, was found such that participants performed better on text information questions (M = 43.718; SE = 2.669) than on boxed information questions (M = 28.542; SE = 3.704).

Table 11 also shows that no significant effects were found for the following: Version, Group, Version x Group, Recall Stem x Version, Recall Stem x Group, or Recall Stem x Version x Group. Clearly contrary to prediction, however, Group approached significance: Readers with attentional deficits (AD) scored somewhat higher (AD Mean = 41.254) than normal control readers (NC Mean = 31.007) (F (1, 35) = 3.155, p = .084).

These results are further illustrated in Figure 4. Means and standard deviations are given in Tables 12, 13, 14, 15, and 16.

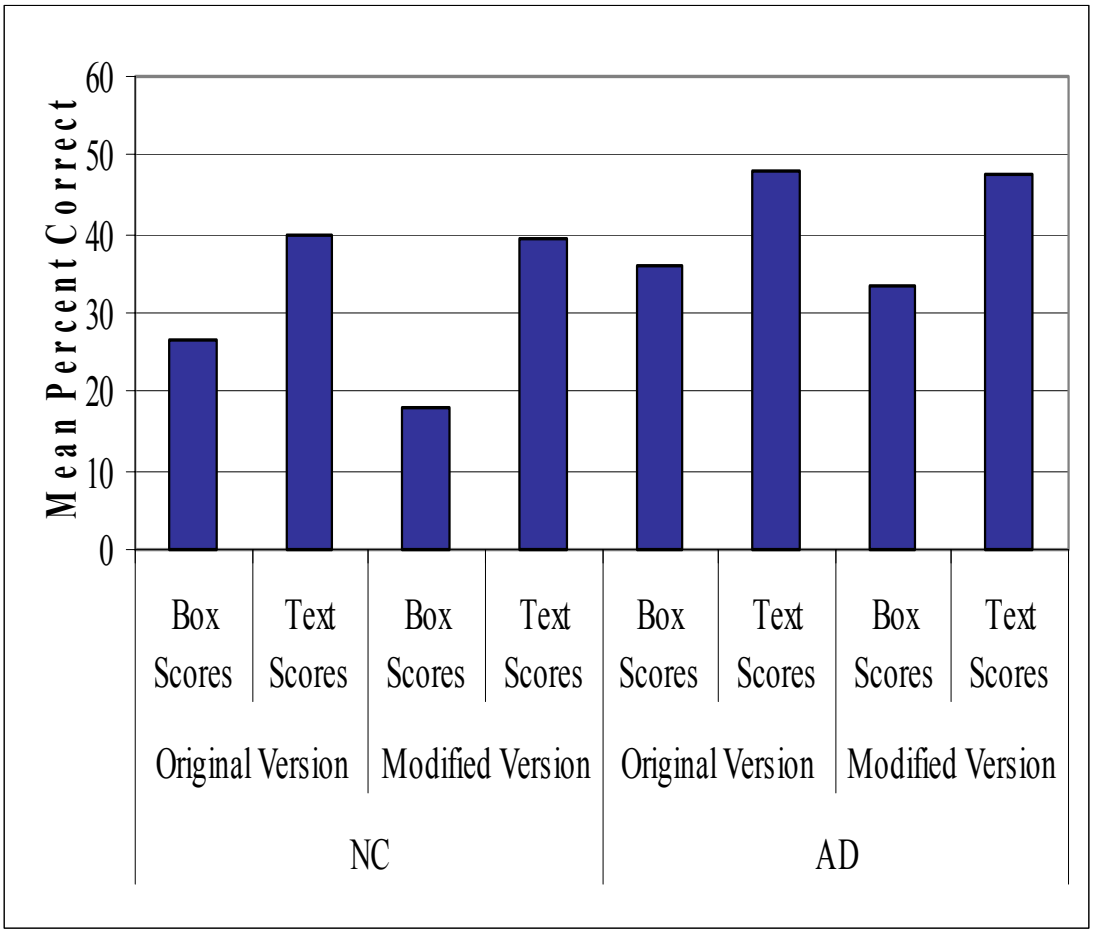

Figure 4. Mean Percent Correct Answers to Recall Questions for NC & AD in OT & MT Text Conditions

Table 12. Mean Percent Correct and Standard Deviations

			Mean Percent Correct	Standard Deviation
NC	Original Version	Box Scores	26.67	19.03
		Text Scores	39.72	15.05
	Modified Version	Box Scores	18.06	17.76
		Text Scores	39.58	13.09
AD	Original Version	Box Scores	36.11	27.05
		Text Scores	47.92	20.40
	Modified Version	Box Scores	33.33	24.85
		Text Scores	47.65	16.31

Table 13. Version (OT vs. MT): Mean Percent Correct and Standard Errors.

Version	Mean Quiz Score (Percentage Correct)	Standard Error
OT	37.60	4.12
MT	34.66	3.97

Table 14. Group (NC vs. AD): Mean Percent Correct and Standard Errors

Diagnosis Group	Mean Quiz Score (Percentage Correct)	Standard Error
NC	31.01	4.19
AD	41.25	3.97

Table 15. Version x Group: Mean Percent Correct and Standard Errors

Version	Group	Mean Quiz Score (Percentage Correct)	Standard Error
OT	NC	33.19	5.58
	AD	42.01	6.24
MT	NC	28.82	6.24
	AD	40.49	3.67

Table 16. Type of Recall Stem (BI vs. TI): Mean Percent Correct and Standard Errors

Type of Recall Stem	Mean Quiz Score (Percentage Correct)	Standard Error
Boxed Information (BI)	28.54	3.70
Text Information (TI)	43.718	2.67

Questionnaire Data

Initial Pool of 130 Participants

Of the 66 participants in the "Original Text" condition, three indicated that they did not read the information in either box in their reading material, eight indicated that they read the information in one box, 53 indicated that they read the information in both boxes, and two did not respond. This information is illustrated in Figure 5.

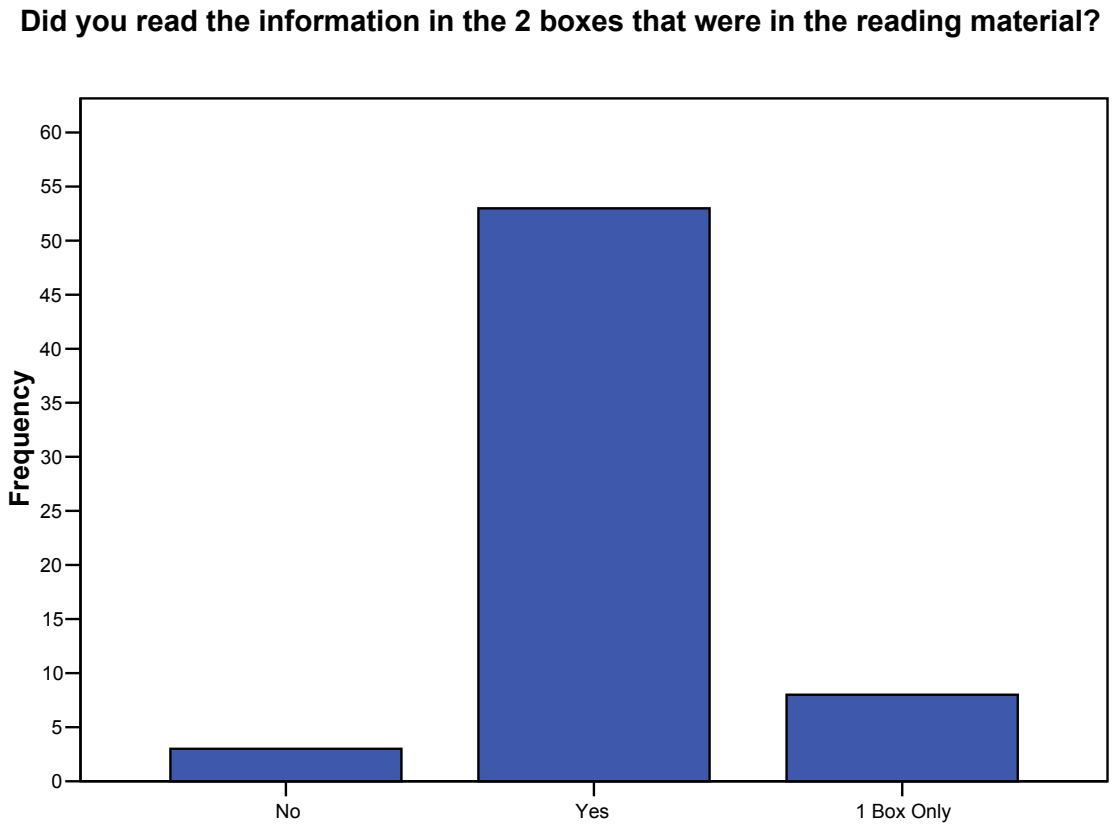

Figure 5. Did you read the information in the 2 boxes that were in the reading material?

The remaining questionnaire data for the initial pool of 130 participants is summarized in Table 17. As illustrated, mean responses for the remaining 12 questionnaire items ranged from 3.22 to 4.98 on a seven point scale (mean = 3.86). These responses quite possibly reflect the fact that participants often choose the middle option of such a scale consistently, perhaps because "[v]ery few people 'always' do something or 'never' feel something about a statement" (Nardi, 2003, p. 70).

Table 17: Questionnaire Data for Initial Pool of 130 Participants

	N	Mean	Standard Deviation
Please rate the clarity of the material you read in terms of content.	128	3.65 1=Extremely Clear 7=Extremely Unclear	1.308
Please rate the clarity of the material you read in terms of layout.	128	3.85 1=Extremely Clear 7=Extremely Unclear	1.293
Please rate the frequency with which you read the information presented inside boxes in textbooks?	128	3.35 1=Always 7=Never	1.519
Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material.	128	3.32 1=Very Helpful 7=Never Helpful	1.163
Please rate the frequency with which you read the preface and / or "Information for Students" at the beginning of a textbook.	128	4.84 1=Always 7=Never	1.650
If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.	127	3.86 1=Always 7=Never	1.612

	N	Mean	Standard Deviation
If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.	128	3.55 1=Always 7=Never	1.999
If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.	128	4.02 1=Always 7=Never	1.653
If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.	128	4.02 1=Always 7=Never	1.739
Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.	128	4.98 1=Very Distracting 7=Never Distracting	1.474
Please rate the amount of study time allowed.	127	3.22 1=Much Too Little 7=Much Too Much	1.053
Please rate the degree to which the quiz questions were worded clearly.	128	3.63 1=Extremely Clear 7=Extremely Unclear	1.334

Of particular interest are participant responses to four questionnaire items. Distributions for these questions are illustrated in Figures 6, 7, 8, and 9.

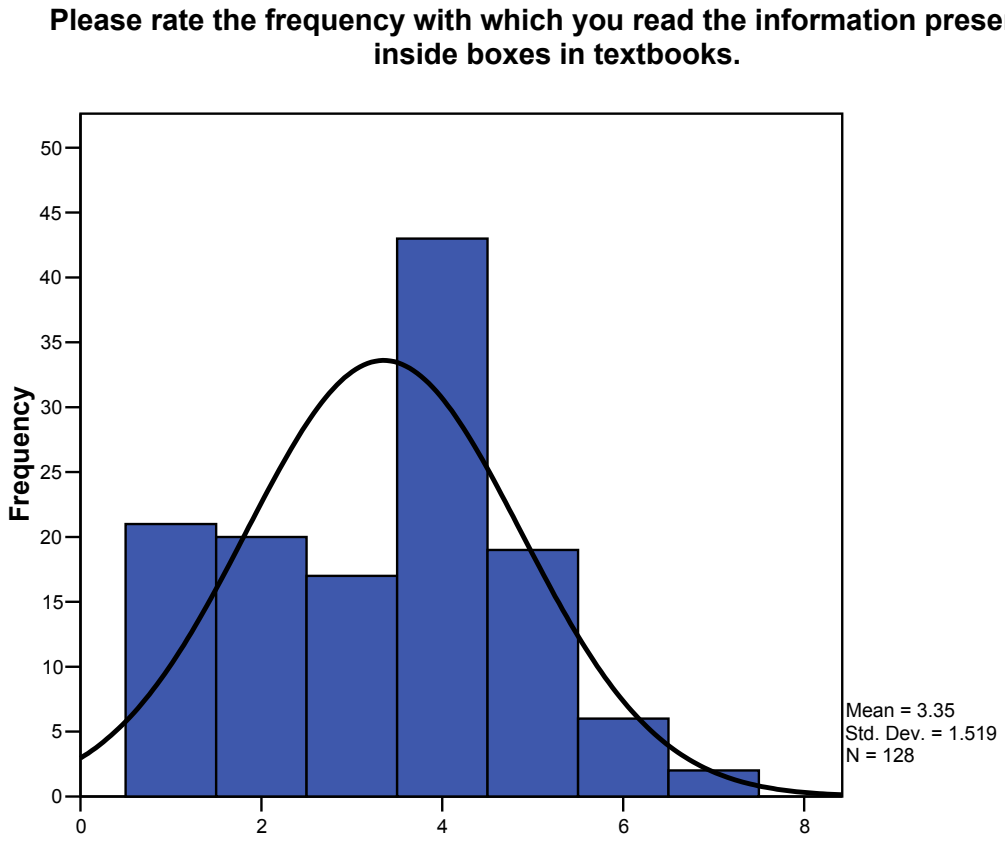

Figure 6: Distribution of Scores for Initial Pool of 130 Participants: Please rate the frequency with which you read the information presented inside boxes in textbooks.

Figure 6 illustrates that participant responses were skewed towards the lower end of the seven point scale used for questionnaire items, indicating that most participants rated that they read information presented inside boxes in textbooks at least sometimes.

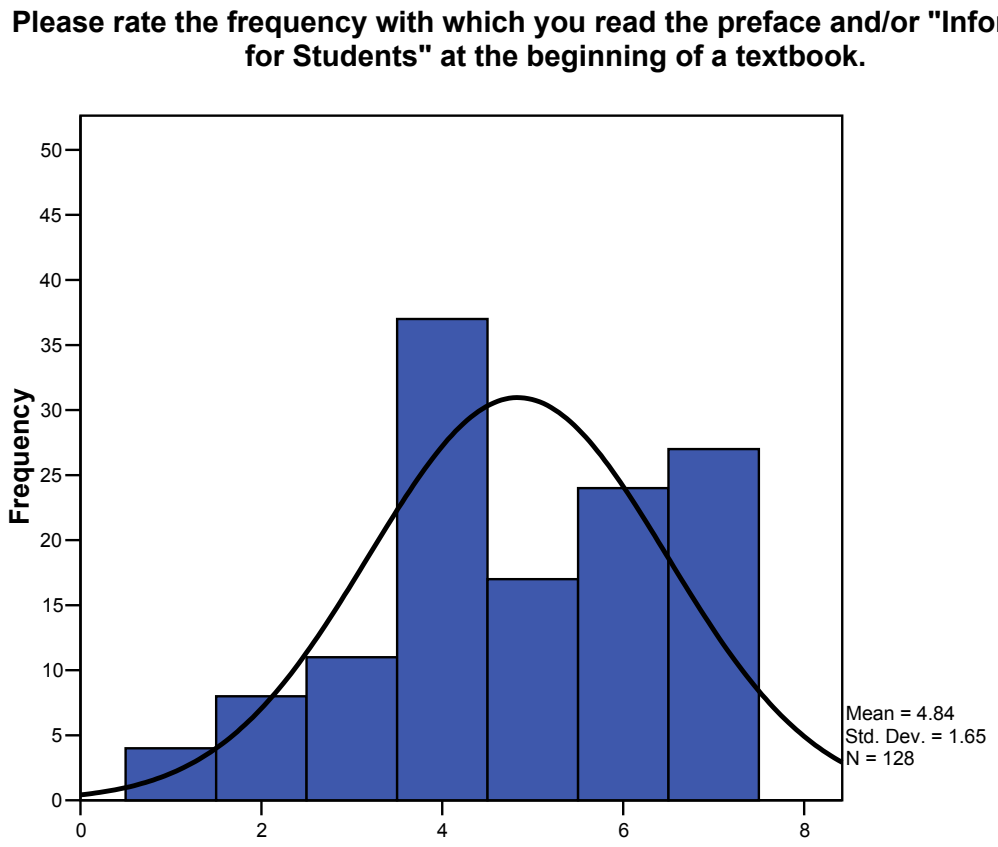

Figure 7: Distribution of Scores for Initial Pool of 130 Participants: Please rate the frequency with which you read the preface and/or "Information for Students" at the beginning of a textbook.

Figure 7 illustrates that participant responses were skewed towards the upper end of the seven point scale used for questionnaire items. This bimodal distribution indicates that most participants rated that they read the preface and/or "Information for Students" between sometimes and never.

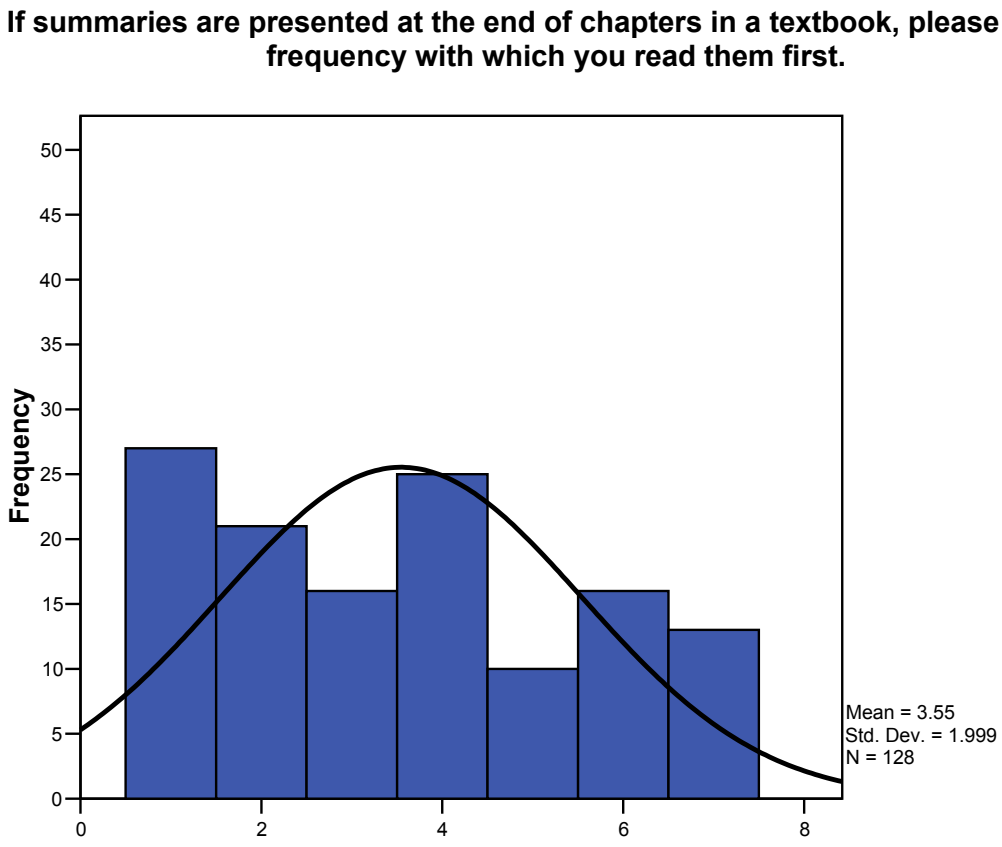

Figure 8: Distribution of Scores for Initial Pool of 130 Participants: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.

Figure 8 illustrates that participant responses were skewed towards the lower end of the seven point scale, indicating that most participants rated that they read summaries presented at the end of chapters in textbooks between sometimes and always.

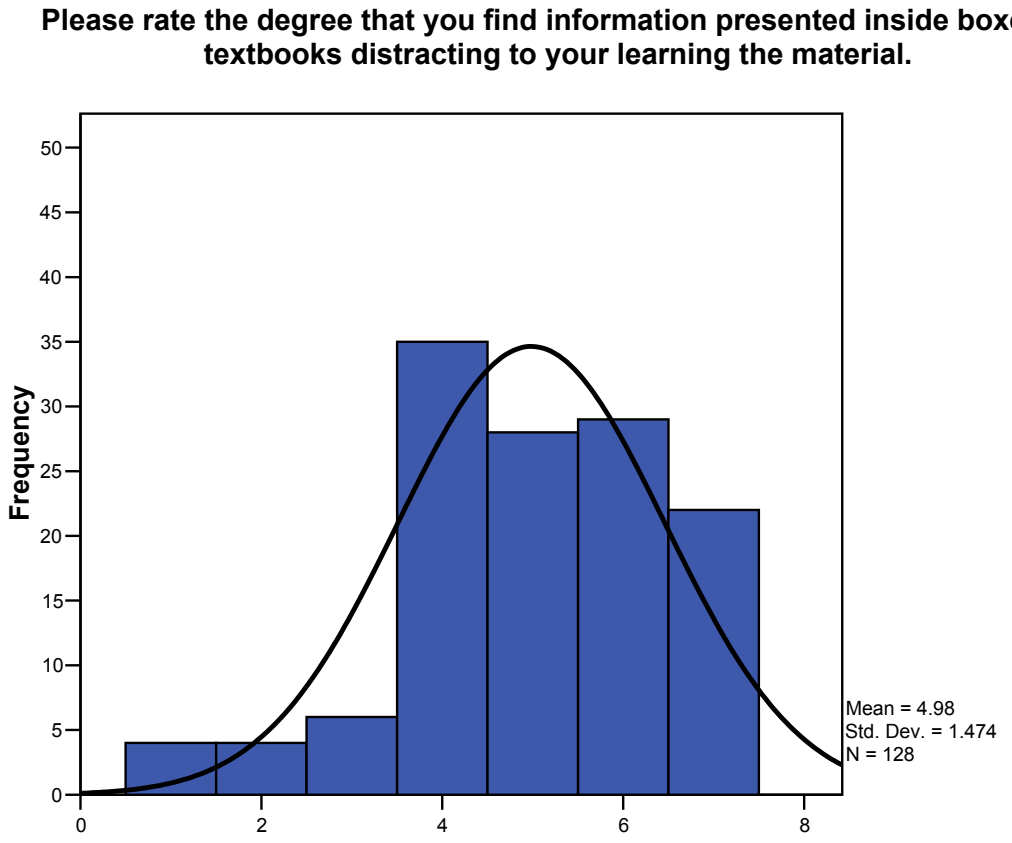

Figure 9: Distribution of Scores for Initial Pool of 130 Participants: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.

Figure 9 illustrates that participant responses were skewed towards the upper end of the seven point scale, indicating that most participants rated that they find information presented inside boxes in textbooks between somewhat and never distracting to their learning the material. These responses indicate that most participants do not view information presented inside boxes in textbooks to be seductive.

Final Experimental Sample of 39 Participants

The final experimental sample for this study consisted of 39 participants. Of the 10 NC participants in the OT condition, eight indicated that they read the information in both boxes in their reading material and two indicated that they read the information in only one box Of the eight AD participants in the OT condition, seven indicated that they read the information in both boxes and one indicated that he or she did not read the information in either box. This information is illustrated in Figures 10 and 11.

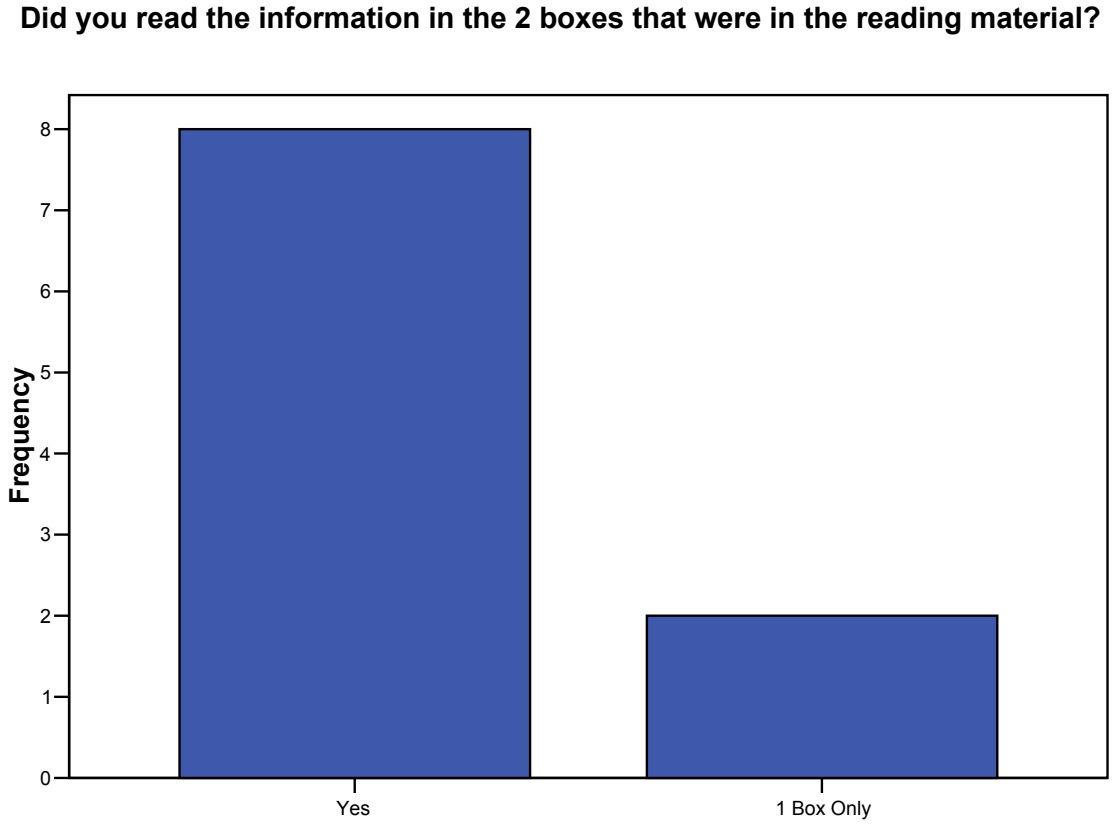

Figure 10. NC Participants: Did you read the information in the 2 boxes that were in the reading material?

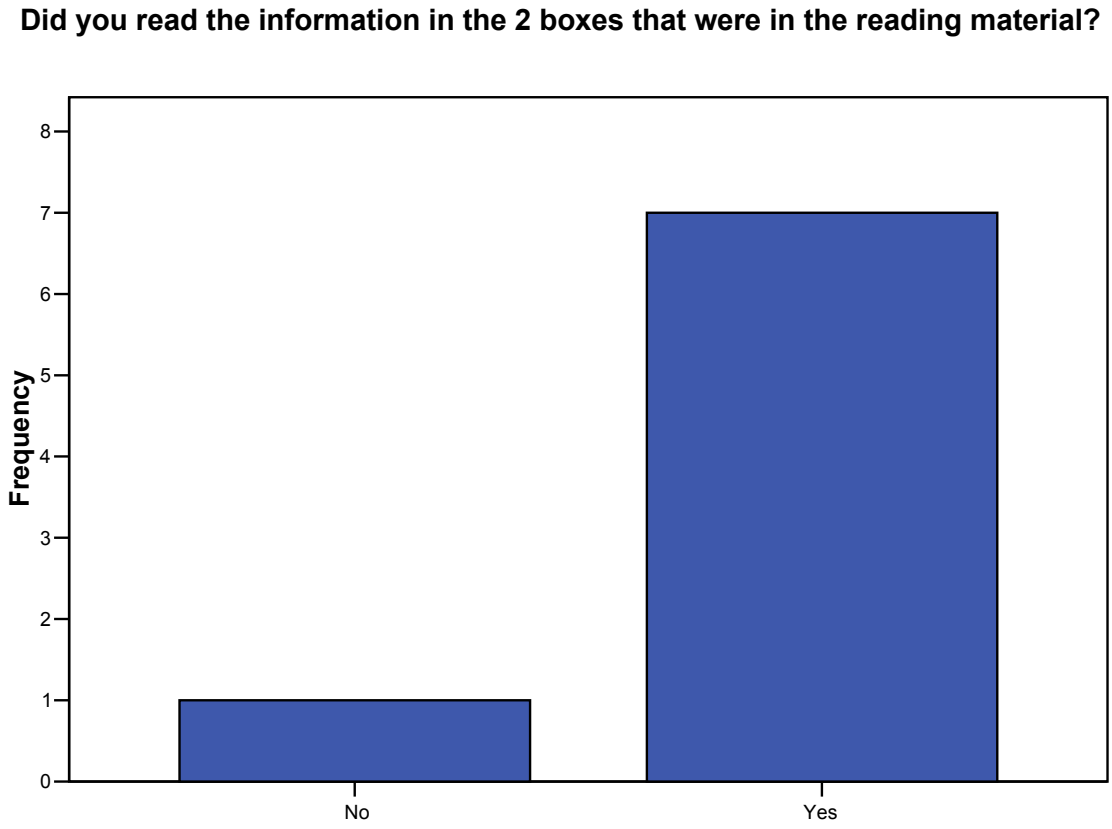

Figure 11. AD Participants: Did you read the information in the 2 boxes that were in the reading material?

The remaining questionnaire data for the final experimental sample of 39 participants is summarized in Table 18, and the results of t-tests comparing NC and AD questionnaire data are summarized in Table 19. Levene's test for equality of variance was not significant for any t-test performed, indicating that the distributions of NC and AD participant responses were approximately equal on any given question. T-test results should still, however, be viewed in light of small n's and the lack of comparison data from other studies.

Of note are the findings that NC and AD participants did not rate significantly differently on either of the first two questions listed on Table 19, indicating that the two groups did not significantly differ in their ratings of clarity of passage content or layout. Also of note, NC and AD participants rated two questions (Questions 4 and 5 from Table 19) significantly differently. AD participants (Mean = 4.10) rated information presented in boxes in textbooks significantly more helpful ($t[37] = -2.728$, $p = .01$) than did NC participants (Mean = 3.00). AD participants (Mean = 5.52) read prefaces and/or "Information for Students" at the beginning of textbooks significantly less often ($t[37] = -3.828$, $p = .001$) than did NC participants (Mean = 3.61). In addition, differences in NC and AD participant ratings approached significance for question three from Table 19: AD participants (Mean = 3.81) read the information presented inside boxes in textbooks more often ($t[37] = =1.909$, $p = .064$) than did NC participants (Mean = 2.83).

NC and AD participants did not differ significantly in their ratings for the remaining seven questions listed on Tables 18 and 19. Means for questions 6-9, 11, and 12 ranged from 3.06 to 4.14, again indicating that participants quite possibly chose middle options to avoid answers using terms such as "always" and/or "never." Means for

question 10 (NC Mean = 5.22; AD Mean = 4.57), although not significantly different ($t[37] = 1.327$, $p = .193$), were not as illustrative of this phenomenon and indicate that all participants rated higher on this question.

Table 18: Questionnaire Data for Final Experimental Sample of 39 Participants

	NC Participant Responses			AD Participant Responses		
***	N	Mean	SD	N	Mean	SD
Please rate the clarity of the material you read in terms of content.	18	3.22	1.353	21	3.86	1.352
Please rate the clarity of the material you read in terms of layout.	18	3.72	1.406	21	4.38	1.359
Please rate the frequency with which you read the information presented inside boxes in textbooks?	18	2.83	1.618	21	3.81	1.569
Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material. *	18	3.00	1.237	21	4.10	1.261
Please rate the frequency with which you read the preface and / or "Information for Students" at the beginning of a textbook. **	18	3.61	1.614	21	5.52	1.504
If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.	18	3.67	1.815	21	3.71	1.765

* $p \leq .01$
** $p < .001$
*** For labels for extreme scores, see Table 17.

	NC Participant Responses			AD Participant Responses		
***	N	Mean	SD	N	Mean	SD
If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.	18	3.22	1.987	21	3.38	2.334
If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.	18	3.78	2.045	21	4.10	1.609
If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.	18	3.89	2.166	21	4.14	1.740
Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.	18	5.22	1.263	21	4.57	1.720
Please rate the amount of study time allowed.	18	3.06	1.110	21	3.24	1.044
Please rate the degree to which the quiz questions were worded clearly.	18	3.83	1.383	21	3.38	1.161

* $p \leq .01$
** $p < .001$
*** For labels for extreme scores, see Table 17.

Table 19: Results of t-tests Comparing NC and AD Questionnaire Data

***	t(37)	Sig. (2-tailed)
Please rate the clarity of the material you read in terms of content.	-1.461	.152
Please rate the clarity of the material you read in terms of layout.	-1.485	.146
Please rate the frequency with which you read the information presented inside boxes in textbooks?	-1.909	.064
Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material.	-2.728	.010*
Please rate the frequency with which you read the preface and / or "Information for Students" at the beginning of a textbook.	-3.828	.000**
If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.	-.083	.934
If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.	-.227	.822
If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.	-.542	.591
If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.	-.406	.687
Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.	1.327	.193
Please rate the amount of study time allowed.	-.529	.600
Please rate the degree to which the quiz questions were worded clearly.	1.111	.274

* $p \leq .01$
** $p < .001$
*** For labels for extreme scores, see Table 17.

Of particular interest are NC and AD response distributions for individual questionnaire items. These distributions are illustrated in Figures 12 through 25.

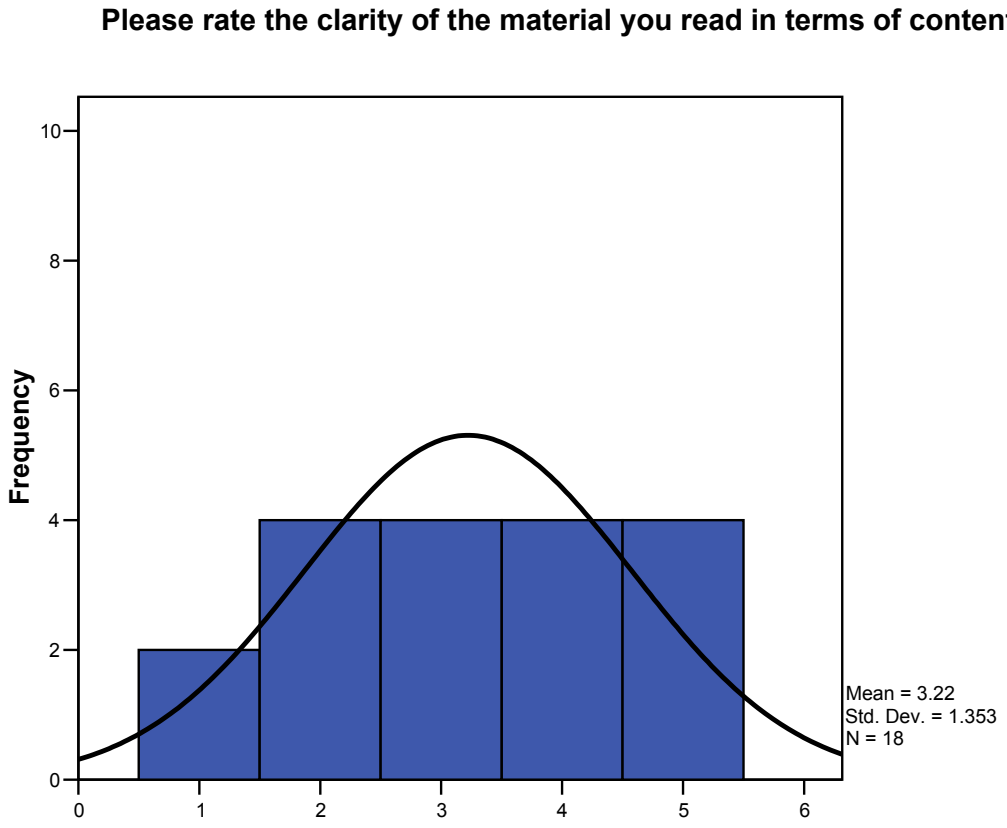

Figure 12: NC Distribution of Scores for Final Experimental Sample: Please rate the clarity of the material you read in terms of content.

Figure 12 illustrates that NC participant responses for this question were distributed evenly across the middle portion of the seven point scale used for questionnaire items.

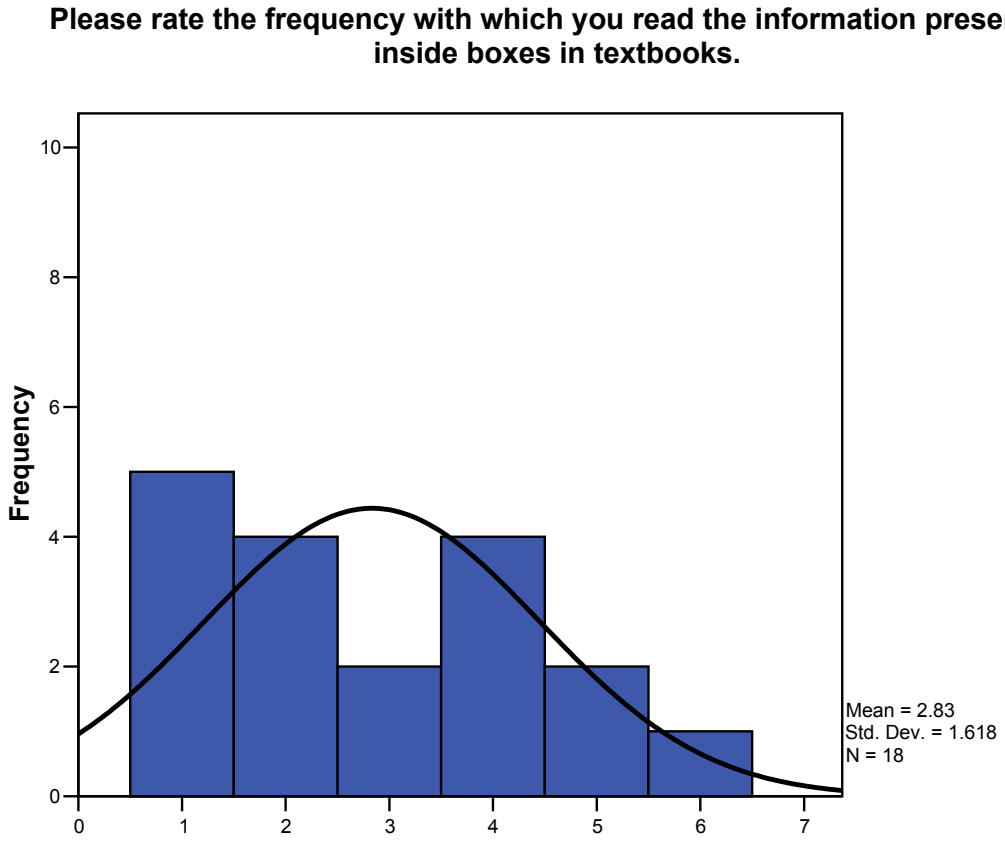

Figure 13: NC Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the information presented inside boxes in textbooks.

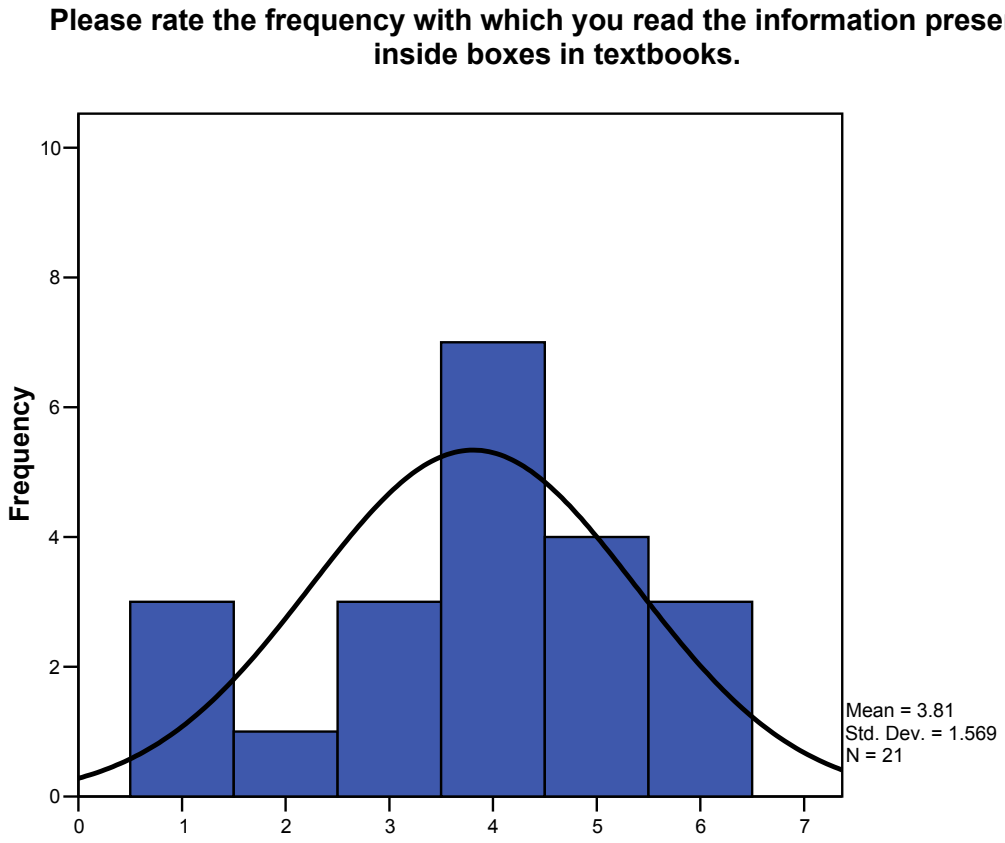

Figure 14: AD Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the information presented inside boxes in textbooks.

Figures 13 and 14 illustrate that NC and AD participant distributions differed substantially on this question. NC participant responses were skewed towards the lower end of the seven point scale used for questionnaire items, indicating that most NC participants rated that they frequently read the information presented inside boxes in textbooks. AD participant responses were skewed toward the upper end of the seven point scale, indicating that most AD participants rated that they infrequently read the information presented inside boxes in textbooks.

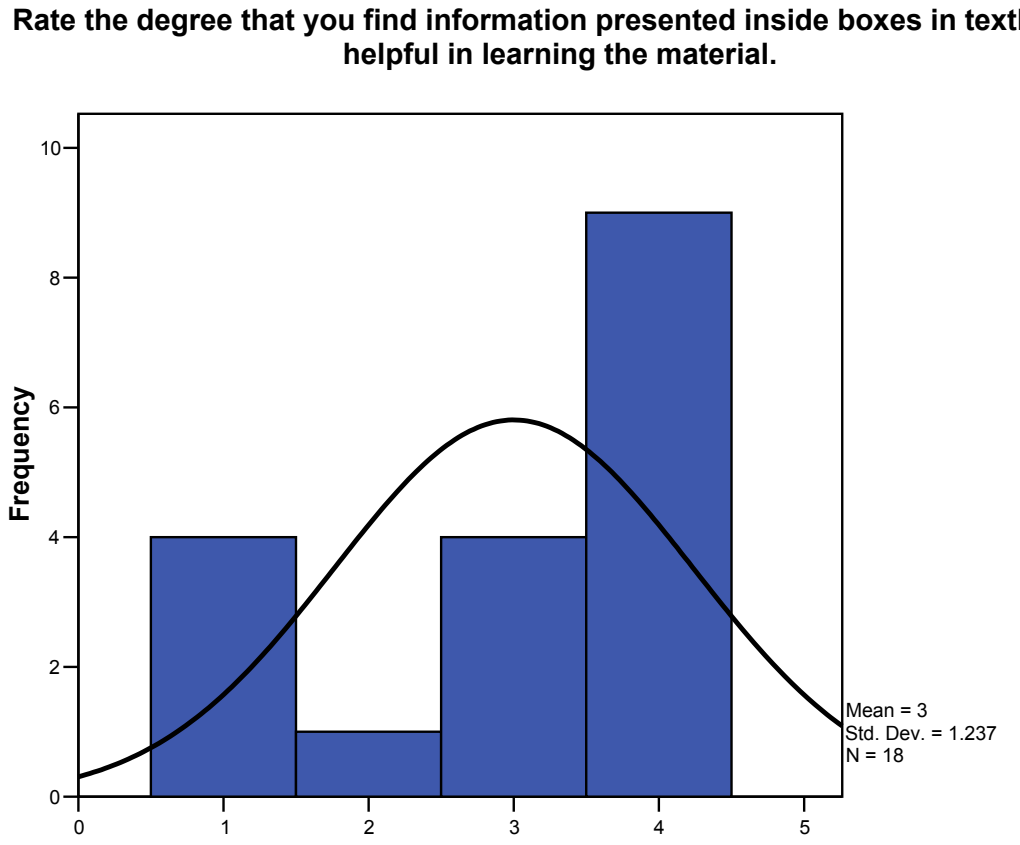

Figure 15: NC Distribution of Scores for Final Experimental Sample: Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material.

Figure 15 illustrates that NC participant responses were skewed toward the upper end of the seven point scale used for questionnaire items, indicating that most NC participants rated that they find information presented inside boxes in textbooks only somewhat to never helpful in learning the material. The AD distribution for this question was approximately normal, which indicates that more AD participants find such information helpful in learning the material.

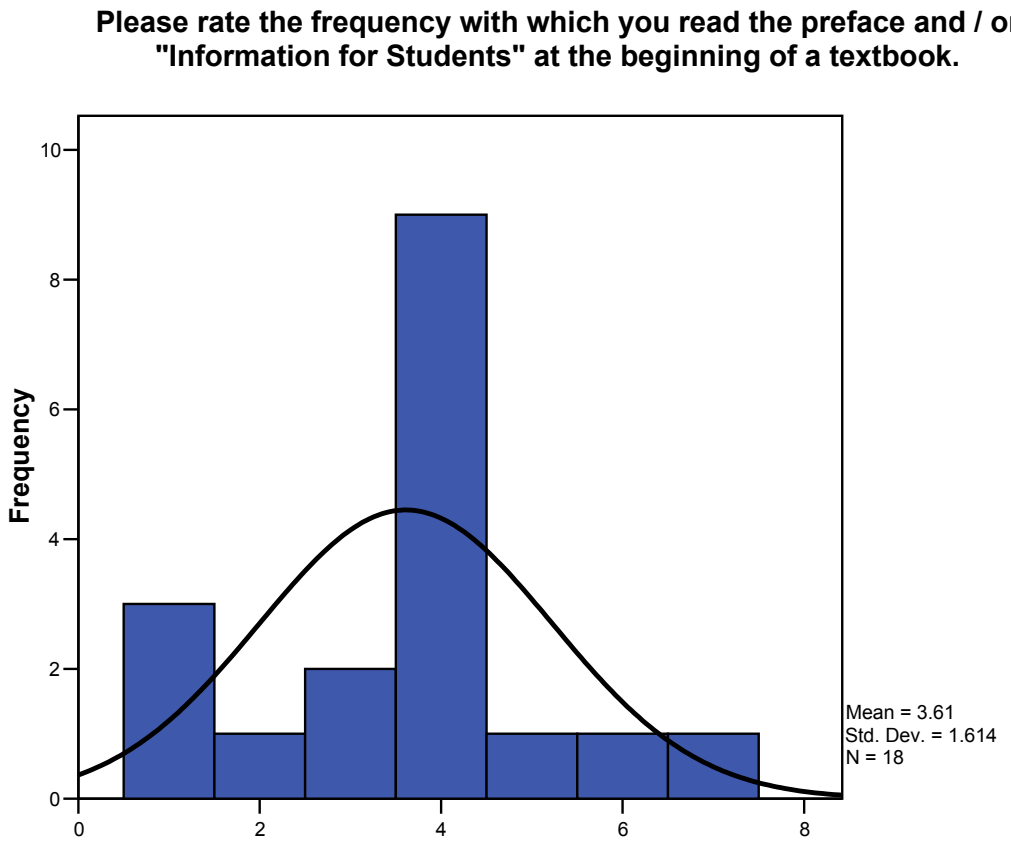

Figure 16: NC Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the preface and/or "Information for Students" at the beginning of a textbook.

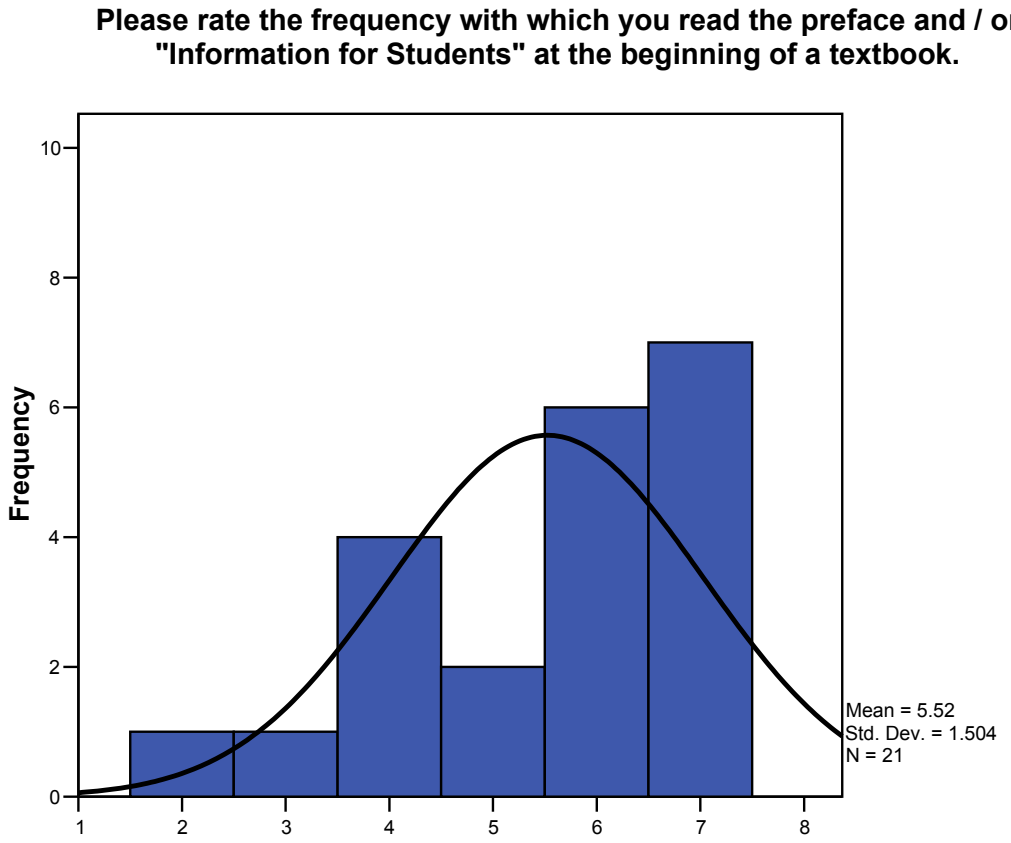

Figure 17: AD Distribution of Scores for Final Experimental Sample: Please rate the frequency with which you read the preface and/or “Information for Students” at the beginning of a textbook.

Figures 16 and 17 illustrate that while the NC participant distribution is bimodal and skewed towards the lower end of the seven point scale used for questionnaire items, the AD participant distribution is skewed towards the upper end of the scale. This indicates that while most NC participants rated that they read the preface and/or "Information for Students" at the beginning of a textbook at least sometimes, most AD participants rated that they read that material infrequently.

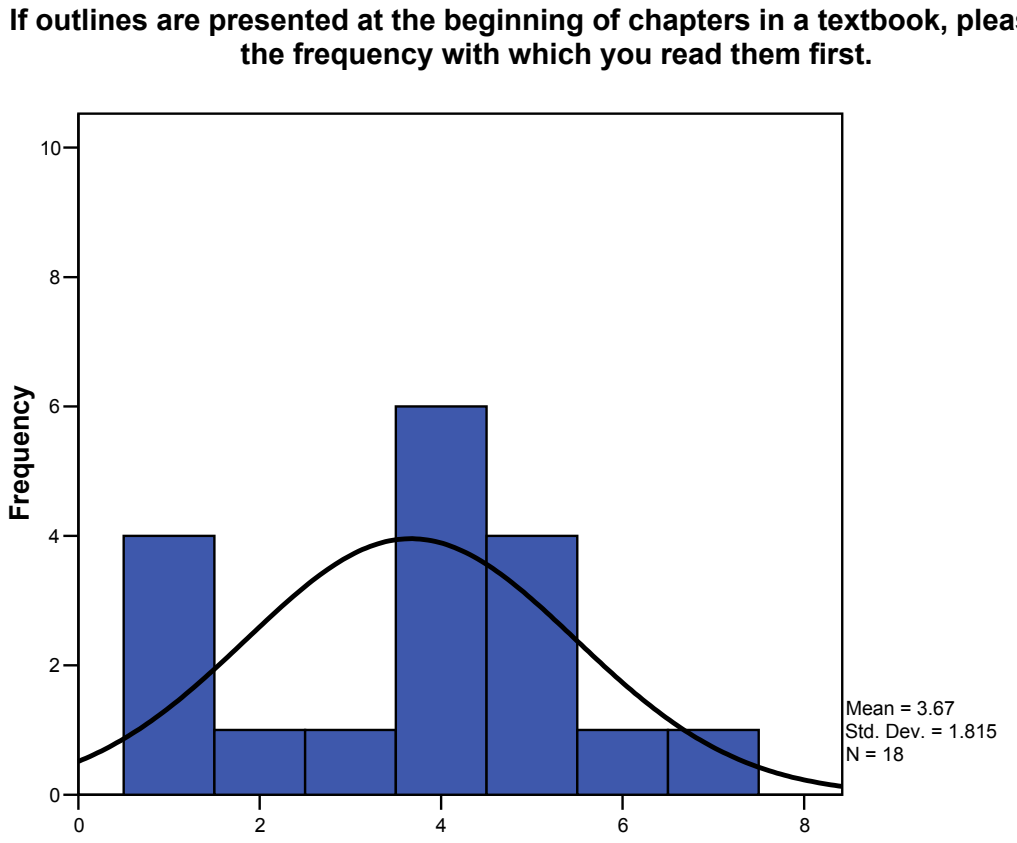

Figure 18: NC Distribution of Scores for Final Experimental Sample: If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.

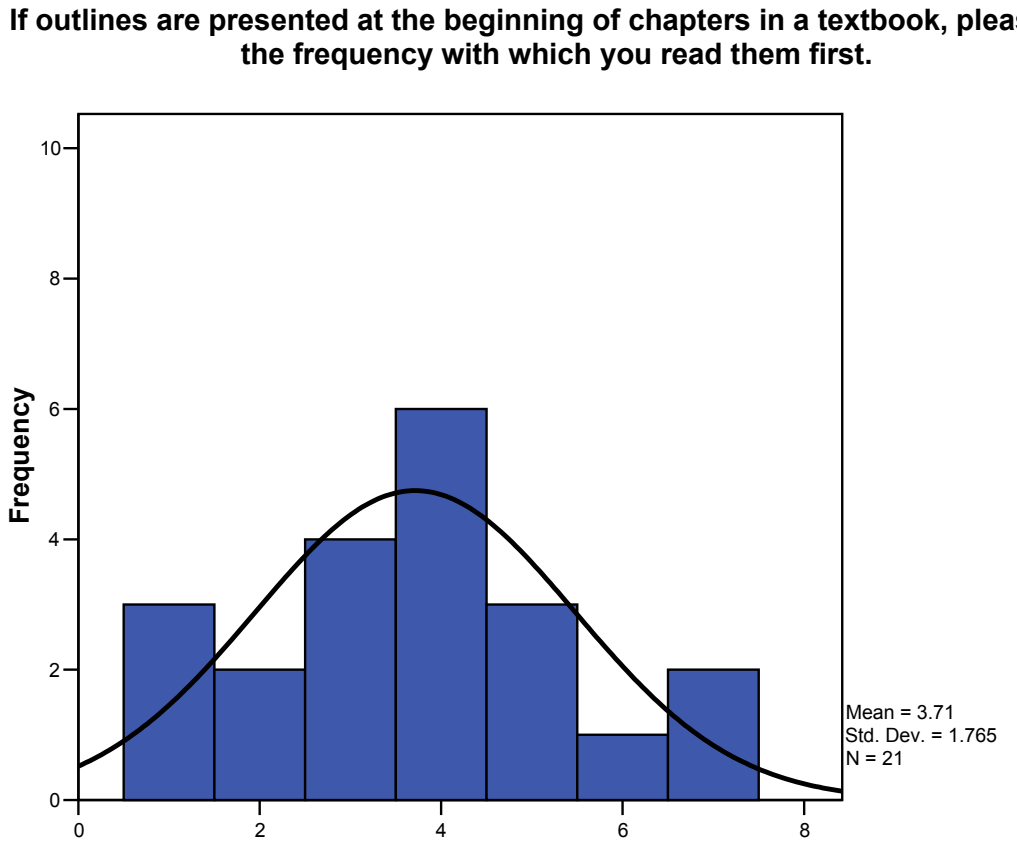

Figure 19: AD Distribution of Scores for Final Experimental Sample: If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.

Figures 18 and 19 illustrate that while the NC participant distribution is clearly bimodal, the AD participant distribution is more normally shaped. This indicates that while more NC participants rated that they "always" read outline presented at the beginning of chapters first, more AD participants rated in the lower portion of the seven point scale overall.

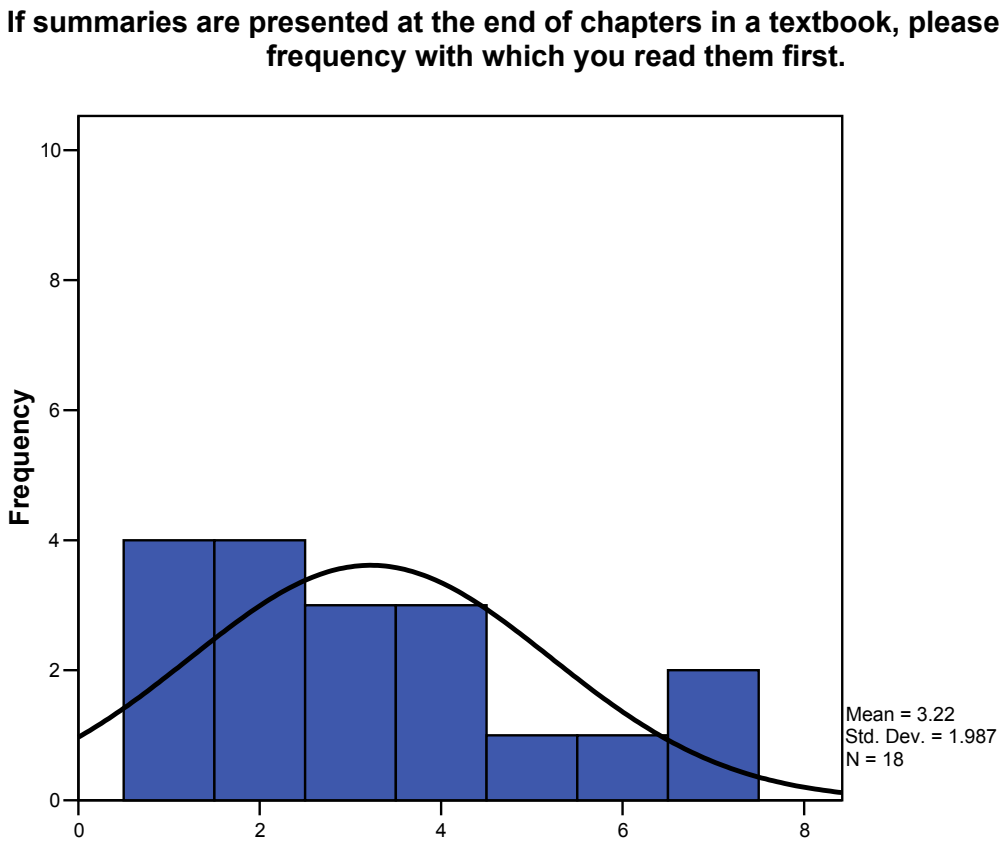

Figure 20: NC Distribution of Scores for Final Experimental Sample: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.

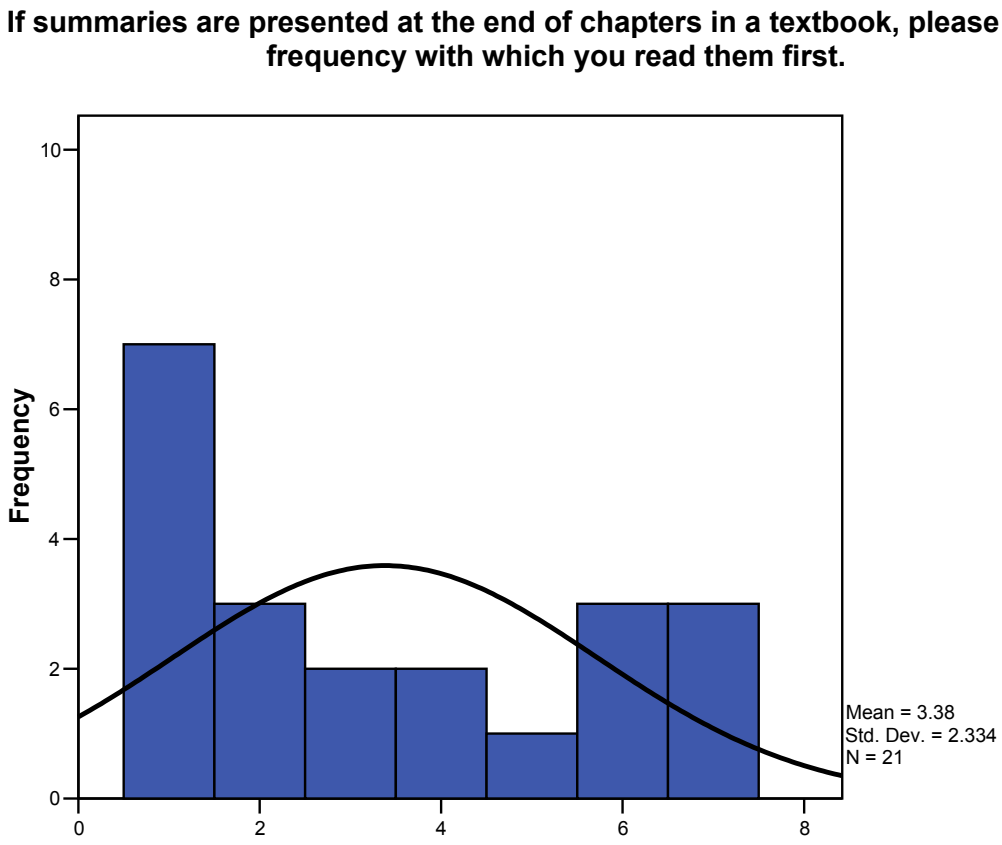

Figure 21: AD Distribution of Scores for Final Experimental Sample: If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.

Figures 20 and 21 illustrate that while the NC participant distribution is clearly skewed toward the lower end of the seven point scale, the AD participant distribution peaks at point one but is more evenly distributed over points two through seven. This indicates that while AD participants are more likely to rate that they "always" read summaries presented at the end of chapters first, the two groups are equally likely overall to rate in the lower portion of the scale.

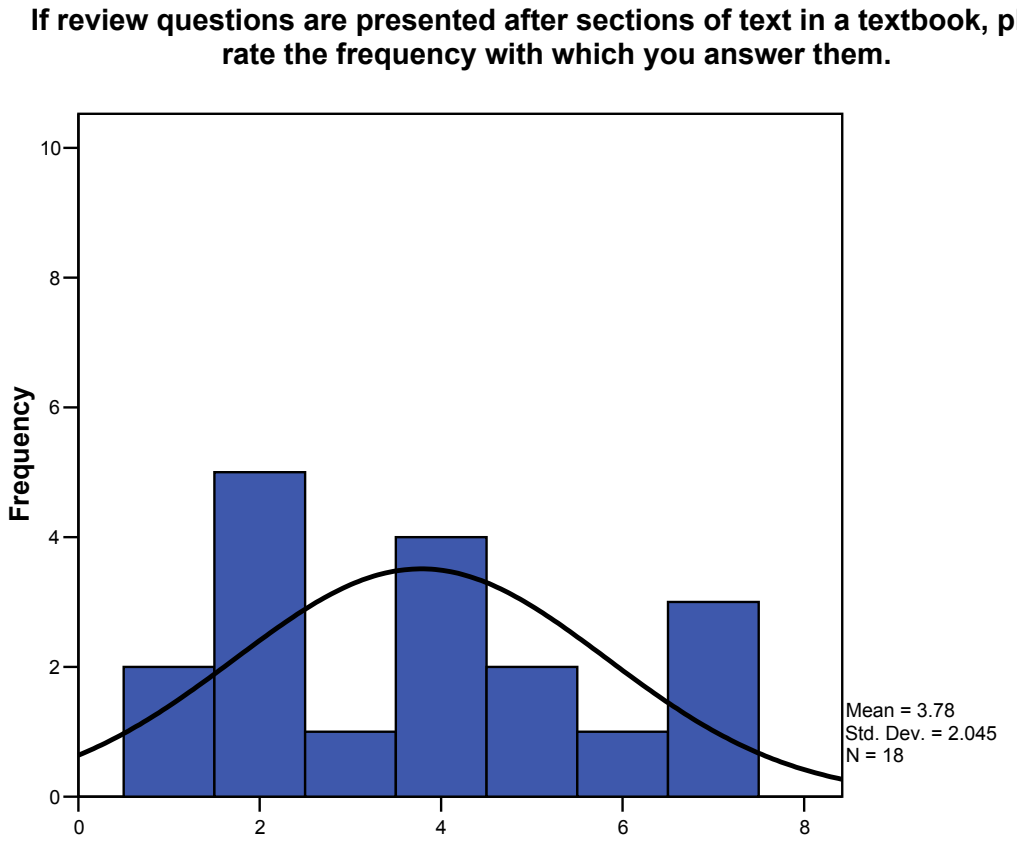

Figure 22: NC Distribution of Scores for Final Experimental Sample: If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.

Figure 22 illustrates that the NC participant distribution for this question is multi-modal. The AD participant distribution for this question is approximately normal.

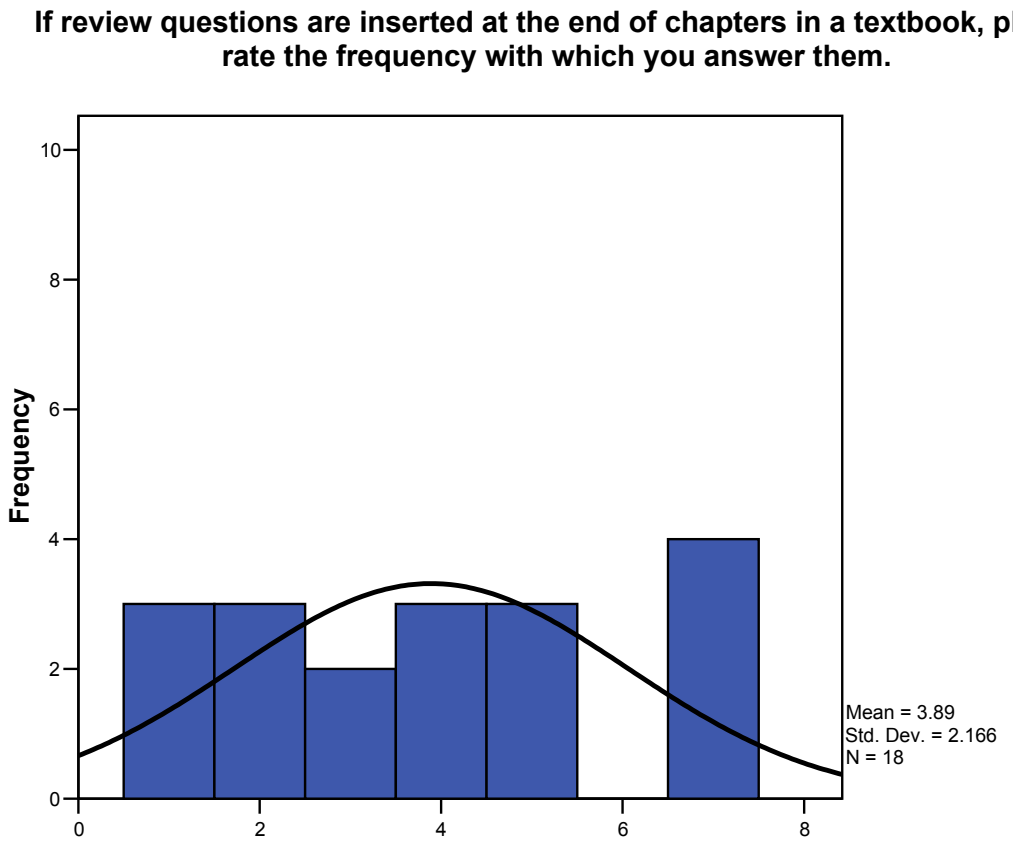

Figure 23: NC Distribution of Scores for Final Experimental Sample: If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.

Figure 23 illustrates that the NC participant distribution for this question is skewed toward the lower end of the seven point scale used for questionnaire items, indicating that most NC participants rated that they answer review questions inserted at the end of chapters in textbooks between sometimes and always. The AD participant distribution for this question is more normally distributed, indicating that more AD participants rated that they infrequently answer such questions.

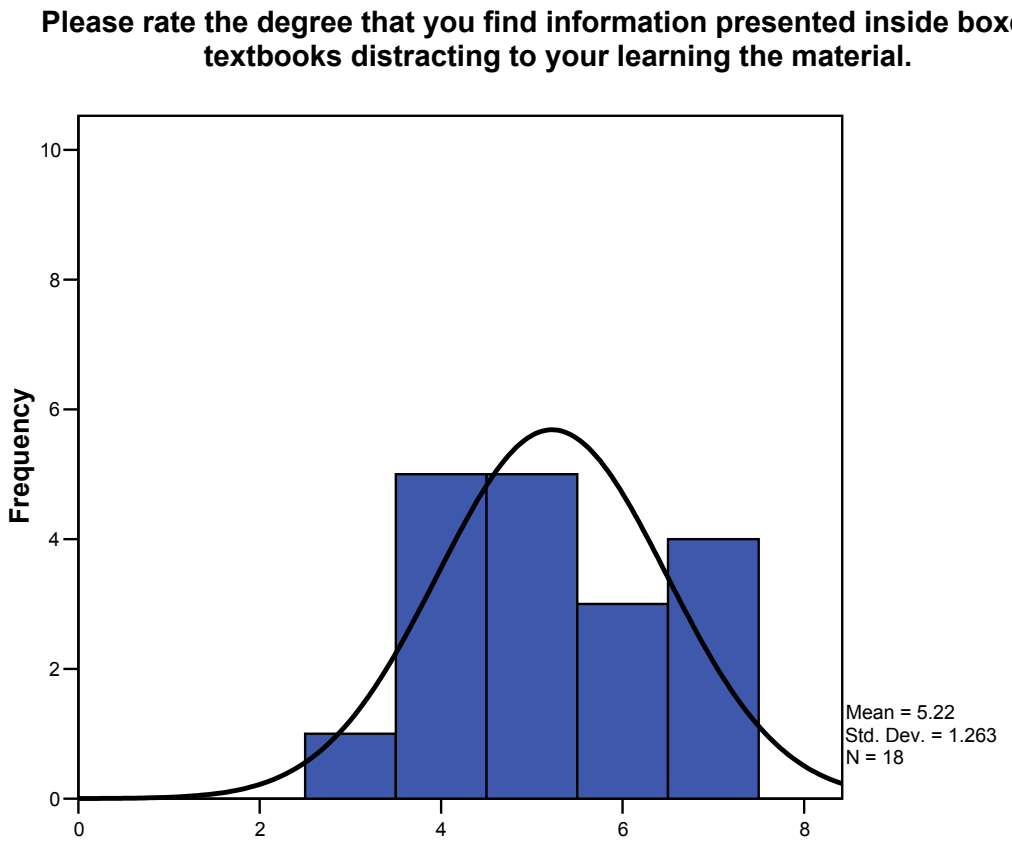

Figure 24: NC Distribution of Scores for Final Experimental Sample: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.

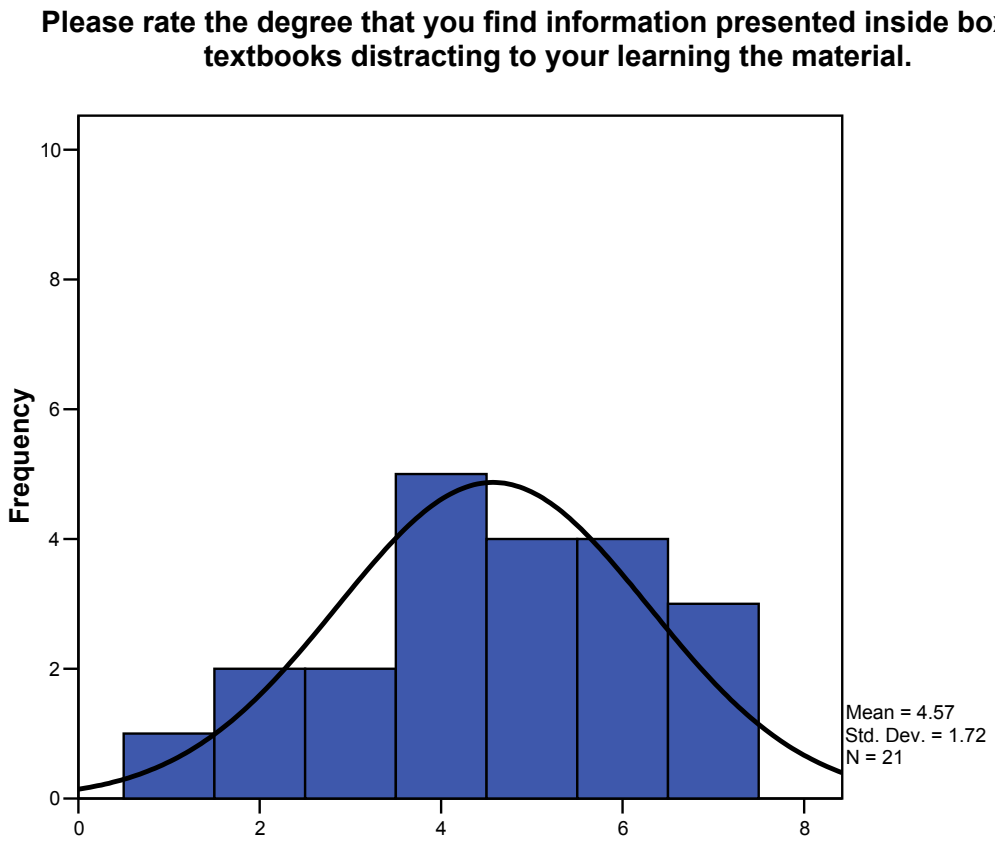

Figure 25: AD Distribution of Scores for Final Experimental Sample: Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.

Figures 24 and 25 illustrate that while the NC participant distribution is skewed toward the upper end of the seven point scale, the AD participant distribution is more normally distributed. This indicates that more AD participants rated that they find information presented inside boxes in textbooks between sometimes and always distracting to their learning the material.

SUMMARY AND DISCUSSION

Summary

Authors and publishers often add interesting but extraneous material to regular text in an attempt to make textbooks more interesting. For example, pictures, stories, boxed material set off from the text, and other pedagogical aids are now common, and have increasingly characterized textbooks since the 1950s (e.g., Weiten & Wight, 1992). Research, however, suggests that such seductive details, "interesting but irrelevant details that are added to a passage to make it more interesting" (Harp & Mayer, 1997, p. 92), interfere with reading comprehension (e.g., Dempster, 1993; Garner et al., 1992; Garner et al., 1989; Wade, 1992). In general, novel, active, concrete, and personally involving details are more memorable to readers than are abstract, general, and structurally important ideas (Garner, Brown, Sanders, & Menke, 1992). Previous studies did not, however, define seductive details to include boxed information, and little if any data exists on this issue. Furthermore, little, if any, research exists on the effect of seductive details on students with serious reading problems, such as those with ADHD and/or LD.

The present research investigated the effect of seductive details, including boxed information, on the reading comprehension of normal and impaired adult readers. "Seductive details" were defined as any extraneous material that had been added to a passage to make it more interesting or any information that had been set off from the main prose passage by physically separating it in some manner, such as in a box. Both theoretical explanations of human memory and research findings on factors influencing reading comprehension indicated that such extraneous details would indeed be seductive.

Hypothesis I

A main effect of version was expected such that, on average, students would recall material better from the modified version (MT), without extraneous information, than from the original version (OT) of actual text material. The results did not support this prediction: Those who read the OT version performed slightly better than did those who read the MT version.

Hypothesis II

A main effect of group was expected such that NC participants would recall better than would AD participants. The results did not support this prediction. Indeed, contrary to prediction, AD participants scored higher, although not significantly, than did NC participants.

Hypothesis III

A main effect of type of recall stem was also expected such that participants would do better on questions regarding text information than on questions regarding boxed information. This hypothesis was confirmed.

Hypothesis IV

A differential effect of seductive details on participants with ADHD and/or other types of learning disorders was predicted such that AD participants would do differentially worse on the OT version than on the MT version than would NC participants. The results did not support this prediction, as the Version x Group interaction was not significant.

Questionnaire Findings

Initial Pool of 130 Participants

Questionnaire findings for the initial pool of 130 participants indicated that, by and large, participants did read the information presented in boxes in the reading materials for this experiment. In addition, these findings represent the first known data on the tendencies of college students to read boxed information in textbooks.

In addition, examination of response distributions for individual questions indicated that most participants read information presented inside boxes in textbooks and summaries presented at the end of chapters between sometimes and always. In contrast, most participants read the preface and/or "Information for Students" between sometimes and never and find information presented inside boxes in textbooks between somewhat and never distracting to their learning the material. These findings have important implications for textbook authors and editors in their efforts to help students better recall information contained in textbooks.

Final Experimental Sample

NC and AD participants did not significantly differ in their ratings of clarity of passage content or layout. However, NC and AD participants rated two other questions significantly differently. AD participants rated material inside boxes in textbooks significantly more helpful than did NC participants, whereas AD participants read prefaces and/or "Information for Students" at the beginning of textbooks significantly less often than did NC participants.

In addition, examination of response distributions for individual questions indicated that most NC participants rated that they frequently read the information

presented inside boxes in textbooks but that they find such information only somewhat to never helpful in learning the material. In contrast, most AD participants rated that they infrequently read the information presented inside boxes in textbooks but that they find such information more helpful than their NC counterparts. These findings indicate that AD readers may not be adopting optimal strategies for reading, which will ultimately hinder their reading comprehension abilities.

Lastly, several response distributions for individual questions were either bimodal, multimodal, or substantially skewed in one direction. These distribution abnormalities must be taken into consideration when examining questionnaire data.

Discussion

The present experiment was designed to evaluate the extent to which seductive details, including boxed information added to textbooks, affected reading comprehension of normal and impaired adult readers. Unfortunately, however, the experiment was limited by low participant numbers and would, as always, have been improved with the aid of hindsight.

Possible explanations for the lack of a significant effect of version (OT vs. MT), and the fact that participants scored, on average, non-significantly higher on the OT version than the MT version, include possible effects of layout of the text information. If the text information layout in the OT version was more conducive to learning than that in the MT version, the results would be explained. Alternatively, these results could also have resulted from the fact that boxed information is not a type of seductive detail, and its elimination from the MT version of the reading material would therefore offer no benefit to students in terms of reading comprehension. Also of note is the fact that this is the

first known study to delete or move material from an actual textbook selection. It is therefore possible that a seductive details effect might not occur in the material as it was presented in this study. A more intriguing explanation, however, is the possibility that the change from color presentation, which might be expected to be particularly seductive, to the black and white version presented in this study significantly reduced the seductive details effect.

Possible explanations for the lack of a significant effect of group (NC vs. AD), and the fact that AD participants scored, on average, non-significantly higher on the reading comprehension quiz than did NC participants, include possible differences between the types of students accepted at university. For instance, if AD students accepted at a major university are, on average, of higher intelligence, reading comprehension ability, or academic performance in general than either NC students or other AD students, AD participant performance on the reading comprehension quiz would be explained. Unfortunately, however, verification of this explanation would have necessitated access to confidential records and psychological evaluations. Such information was not available for the current study.

Questionnaire findings that students only sometimes read the information presented inside boxes in textbooks and that impaired readers less often read and find less helpful boxed information presented inside boxes in textbooks have important implications for textbook design overall and for teaching and textbook design strategies for impaired readers.

Specific Limitations of the Present Experiment

Other design and participant factors likely had negative impact on this study. For instance, low participant turnout was certainly a factor, as was the lack of confirmed ADHD or LD diagnoses for some AD participants. Furthermore, screening and controlling for medications used to treat ADHD would also have benefited the study. Finally, this study would have been improved by the exclusion of any participants without a previous ADHD or LD diagnosis if they either self-identified as bi-polar or depressed or scored too high on the BDI. Due to low participant turnout, this was not possible for the current study.

A possible confound in the present study is the difference in length of the OT and MT versions of the text material. Whereas previous studies have used MT passages that were noticeably longer than their OT counterparts, the present study's MT version was slightly shorter than the OT version. Although the total difference in length was only 20 lines of text and headings, this difference could account for the somewhat confusing findings. In addition, the large number of t-tests on questionnaire items risked Type I errors and any differences in these results should therefore be considered tentative.

Suggestions for Future Research

As mentioned above, the use of color and equalization of OT and MT text length would greatly improve the text versions used in the present study. In addition, among the questions that the experimenters should have posed are the following: (1) How often do you feel you are tested on information that is contained in boxes? and (2) Please rate the frequency with which you read assigned text. In addition, a better understanding of how well college students with ADHD and/or LD perform in comparison to normal college

students would have aided the experimenters in making predictions about the current study.

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APPENDIX

Appendix A: UNCW Disability Services Flier

Students with ADHD or LD:

We are looking for undergraduate or graduate students 18 years or older who are diagnosed with Attention Deficit Hyperactivity Disorder (ADHD; formerly known as ADD), Learning Disabilities (LD), or ADHD and LD to participate in an experiment on reading comprehension.

The study has potential implications for the design of text materials for all students, especially those with ADHD or LD. It is the thesis research of a UNCW psychology graduate student with ADHD and has been approved by the UNCW Institutional Review Board (IRB) for protection of human subjects. All data will be kept confidential and no names will be used. The experiment, conducted on campus, will take about one hour. If interested in participating, please contact:

Devan Culbreth
UNCW Department of Psychology
(910) 799-7868
(910) 512-2477
CulbrethP@uncwil.edu

Please call at your earliest convenience!

Students with no diagnosed disorder are also welcome to participate!

Appendix B: Flier Distributed in the Wilmington Area

Persons with ADHD or LD:

We are looking for persons 18 years and older diagnosed with Attention Deficit Hyperactivity Disorder (ADHD; formerly known as ADD), Learning Disabilities (LD), or ADHD and LD to participate in an experiment on reading comprehension.

The study has potential implications for the design of text materials for all students, especially those with ADHD or LD. It is the thesis research of a UNCW psychology graduate student with ADHD and has been approved by the UNCW Institutional Review Board (IRB) for protection of human subjects. All data will be kept confidential and no names will be used. The experiment, conducted at UNCW, will take about one hour. If interested in participating, please contact:

Devan Culbreth
UNCW Department of Psychology
(910) 799-7868
(910) 512-2477
CulbrethP@uncwil.edu

Please call at your earliest convenience!

Persons with no diagnosed disorder are also welcome to participate!

Appendix C: Flier Distributed to area Psychologists and Psychiatrists

Clients with ADHD or LD:

We are looking for persons 18 years and older diagnosed with Attention Deficit Hyperactivity Disorder (ADHD; formerly known as ADD), Learning Disabilities (LD), or ADHD and LD to participate in an experiment on reading comprehension.

The study has potential implications for the design of text materials for all students, especially those with ADHD or LD. It is the thesis research of a UNCW psychology graduate student with ADHD and has been approved by the UNCW Institutional Review Board (IRB) for protection of human subjects. All data will be kept confidential and no names will be used. The experiment, conducted at UNCW, will take about one hour. If interested in participating, please contact:

Devan Culbreth
UNCW Department of Psychology
(910) 799-7868
(910) 512-2477
CulbrethP@uncwil.edu

Please call at your earliest convenience!

Appendix D: Informed Consent Form

Informed Consent Form
Reading Comprehension Study

The purpose of this research is to further our knowledge about the way in which presentation of information affects reading comprehension.

You will first complete three questionnaires, one of which will ask about aspects of your personal history. Please answer all questions honestly. You will then read and study a textbook passage and answer several questions, in quiz format, about the information in the passage. It is not a test of intelligence or verbal memory in general. This experiment will not expose you to any dangers or risks to your well-being. Your participation is completely voluntary. You can stop the session any time you want, without penalty.

Your data will be coded with a randomly generated subject number and no other identifying information will be connected with any of your data. In addition, only group data will be reported, further ensuring the confidentiality of your responses. All data gathered pertaining to your behavior in this study will be kept in a locked room, and no individuals will be identified. You may ask questions at any time if you are unsure of what is expected of you during the experiment. You may terminate your participation in this experiment at any time and not be penalized.

If you have any questions now or during the session, please feel free to ask us.

By signing below, you consent to participate in this experiment and state that you have read and understand the description above.

_____	_____	If general psychology student, print instructor's name below.
(Signed)	(Print Your Name)	
_____	_____	_____
(Experimenter)	(Date)	(Instructor)

If you have any question after the session, contact:
Dr. Robert T. Brown
Department of Psychology
UNC Wilmington (962-3373)

Appendix E: The Wender Utah Rating Scale (WURS)

Questionnaire #1
The Wender Utah Rating Scale (WURS)

Please rate the following items as describing your childhood.

As a child I was (or had):	Not at all or Very slightly	Mildly	Moderately	Quite a bit	Very Much
1. Concentration problems, easily distracted					
2. Anxious, worrying					
3. Nervous, fidgety					
4. Inattentive, daydreaming					
5. Hot or short-tempered, low boiling point					
6. Temper outbursts, tantrums					
7. Trouble with stick-to-it-tiveness					
8. Stubborn, strong-willed					
9. Sad or blue, depressed, unhappy					
10. Disobedient, rebellious, sassy					
11. Low opinion of myself					
12. Irritable					
13. Moody, ups and downs					
14. Angry					
15. Trouble seeing things from someone else's point of view					
16. Acting without thinking, impulsive					
17. Tendency to be immature					
18. Guilty feelings, regretful					
19. Losing control of myself					
20. Tendency to be or act irrational					
21. Unpopular with other children					
22. Trouble with authorities, trouble with school, visits to principal's office					
23. Overall a poor student, slow learner					
24. Trouble with mathematics or numbers					
25. Not achieving up to potential					

Appendix F: The Beck Depression Inventory (BDI)

Questionnaire #3
Mood Scale

Please indicate one statement from each of the following groups that seems to fit you best at the present time.

A.
___I do not feel sad
___I feel blue or sad
___I am blue or sad all the time and I can't seem to snap out of it
___I am so sad or unhappy that it is very painful
___I am so sad or unhappy that I can't stand it

B.
___I am not particularly pessimistic or discouraged about the future
___I feel discouraged about the future
___I feel I have nothing to look forward to
___I feel that I won't ever get over my troubles
___I feel that the future is hopeless and that things cannot improve

C.
___I do not feel like a failure
___I feel I have failed more than the average person
___I feel I have accomplished very little that is worthwhile or that means anything
___As I look back on my life all I can see is a lot of failures
___I feel I am a complete failure as a person

D.
___I am not particularly dissatisfied
___I feel bored most of the time
___I don't enjoy things the way I used to
___I don't get satisfaction out of anything any more
___I am dissatisfied with everything

E.
___I don't feel particularly guilty
___I feel bad or unworthy a good part of the time
___I feel quite guilty
___I feel bad or unworthy practically all the time now
___I feel as though I am very bad or worthless

F.
___I don't feel I am being punished
___I have a feeling that something bad may happen to me
___I feel I am being punished or will be punished
___I feel I deserve to be punished
___I want to be punished

G.
___I don't feel disappointed in myself
___I am disappointed in myself
___I don't like myself
___I am disgusted with myself
___I hate myself

H.
___I don't feel I am any worse than anybody else
___I am very critical of myself for my weaknesses or mistakes
___I blame myself for everything that goes wrong
___I feel I have many bad faults

I.
___I don't feel I look any worse than I used to
___I am worried that I am looking old or unattractive
___I feel that there are permanent changes in my appearance and they make me look unattractive
___I feel that I am ugly or repulsive looking

J.
___I don't cry any more than usual
___I cry more now than I used to
___I cry all the time now. I can't stop it
___I used to be able to cry but now I can't cry at all even though I want to

K.
___I am no more irritated now than I ever am
___I get annoyed or irritated more easily than I used to
___I feel irritated all the time
___I don't get irritated at all at the things that used to irritate me

L.
___I have not lost interest in other people
___I am less interested in other people now than I used to be
___I have lost most of my interest in other people and have little feeling for them
___I have lost all my interest in other people and don't care about them at all

M.
___I make decisions about as well as ever
___I am less sure of myself now and try to put off making decisions
___I can't make decisions any more without help
___I can't make any decisions at all any more

N.
___I can work about as well as before
___It takes extra effort to get started at doing something
___I don't work as well as I used to
___I have to push myself very hard to do anything
___I can't do any work at all

O.
___I can sleep as well as usual
___I wake up more tired in the morning than I used to
___I wake up 1-2 hours earlier than usual and find it hard to get back to sleep
___I wake up early every day and can't get more than 5 hours sleep

P.
___I don't get any more tired than usual
___I get tired more easily than I used to
___I get tired from doing anything
___I get too tired to do anything

Q.
___My appetite is no worse than usual
___My appetite is not as good as it used to be
___My appetite is much worse now
___I have no appetite at all any more

R.
___I haven't lost much weight, if any, lately
___I have lost more than 5 pounds
___I have lost more than 10 pounds
___I have lost more than 15 pounds

S.
___I am no more concerned about my health than usual
___I am concerned about aches and pains or upset stomach or constipation or other unpleasant feelings in my body
___I am so concerned with how I feel or what I feel that it's hard to think of much else
___I am completely absorbed in what I feel

T.
___I have not noticed any recent change in my interest in sex
___I am less interested in sex than I used to be
___I am much less interested in sex now
___I have lost interest in sex completely

Appendix G: Personal History Questionnaire

Questionnaire #2
Personal History Questionnaire

The data we collect can be influenced by a number of factors, so we would like some information concerning your personal history. These questions will allow us to understand and interpret your responses better. We will not report any individual responses to these questions, only group averages. If you do not wish to answer a particular question, leave it blank. Please feel free to ask us to clarify any questions on this form.

Age: ____Years _____Months

Academic Classification (circle one): Freshman Sophomore Junior Senior

Graduate Other (please specify):_____

Sex: _____M _____F

Today's Date: _____

Do you suffer from any visual deficits or problems that prohibit you from being able to read?

Are you currently taking any medication (internal or external)?
If so, what problem is it treating, what is the dosage, and how long have you been taking it?

Please indicate if you have ever been diagnosed with any of the following disorders.

	Yes	No
Bi-Polar Disorder or Depression		
Schizophrenia		
Attention-Deficit Hyperactivity Disorder (ADHD) or Attention Deficit Disorder (ADD)		
Obsessive Compulsive Disorder (OCD)		
Other type of Learning Disability (LD) Please Specify :_____		

If you answered yes for any of these disorders, please indicate when you were diagnosed and if you are taking any medications for this disorder.

Appendix H: Instructions and Original Text Layout Version of Reading Material

See Back Pocket

Appendix I: Instructions and Modified Text Layout Version of Reading Material

See Back Pocket

Appendix J: Reading Comprehension Quiz

Reading Comprehension Study Quiz

On the Scantron, mark the best answer to each question *based on the passage that you read.*

1. Through what means has Kevin learned to express himself?
   a. sign language
   b. a key board
   c. talking
   d. assistive technology
   e. none of the above

2. Kevin is capable of which activities?
   a. communicating via a personal communication board
   b. using various switches
   c. maneuvering his wheelchair
   d. all of the above
   e. none of the above

3. Which diminishes the impact of a severe disability?
   a. familial support
   b. school services
   c. understanding of how to adapt the environment
   d. technology
   e. both c and d

4. Individuals with severe and multiple disabilities require assistance from professionals in which field(s)?
   a. social services
   b. education
   c. medicine
   d. psychology
   e. all of the above

5. Historically, terminology associated with severe disabilities communicated _____?
   a. hopefulness
   b. a caring attitude
   c. despair
   d. flexibility

6. "Abt Associates" described individuals with severe disabilities as incapable of attending to which cues?
   a. social stimuli
   b. pain
   c. warmth
   d. cold
   e. social reinforcement

7. Rocking and pacing are examples of _____?
   a. self-stimulation
   b. ritualistic behaviors
   c. self-mutilation
   d. both a. and b.
   e. both a. and c.

8. Who proposed a definition of severe and multiple disabilities that moved away from negative terminology to descriptions of the individual's developmental characteristics?
   a. Haring
   b. Meyer
   c. Sailor
   d. Justen

9. Justen's definition of 'severely handicapped' refers to individuals who function at approximately _____ of their chronological age.
   a. one fourth
   b. one third
   c. one half
   d. three fourths

10. In learning situations, what do severely handicapped individuals require in order to perform optimally?
   a. structure
   b. freedom
   c. choices
   d. lack of control

11. Sailor and Haring's definition of severely disabled/handicapped was oriented to each individual's _____ needs.
   a. familial
   b. social
   c. medical
   d. educational
   e. none of the above

12. Who suggested that emphasis be placed on supporting individuals in inclusive classroom settings?
   a. Justen
   b. Snell
   c. Meyer
   d. Sailor
   e. Haring

13. What does TASH stand for?
   a. The Alliance for children with Severe Handicaps
   b. The Association for Persons with Severe Handicaps
   c. The Alliance for People who are Severely Hindered
   d. The Association for Persons who are Severely Hindered

14. The TASH definition of a severely disabled person focuses on the relationship of the _____ with the _____.
   a. social functioning/environment
   b. individual/familial functioning
   c. individual/environment
   d. social functioning/academic functioning

15. Which life activities generally require support for a severely disabled person?
   a. mobility
   b. learning as necessary for independent living
   c. self-sufficiency
   d. both a. and c.
   e. all of the above

16. When evaluating an individual's adaptive fit, we should determine their capability to cope with _____, _____, and _____ requirements.
   a. social, community, and school
   b. educational, familial, and community
   c. personal, familial, and community
   d. family, school, and community

17. An individual's adaptive fit is a(n) _____ process.
   a. static
   b. explosive
   c. dynamic
   d. supportive

18. What characteristics would not be described in the psychological file of a person with severe disabilities?
    a. physical characteristics
    b. physical impairments
    c. behavior problems
    d. intellectual shortcomings

19. Clinical histories have a tendency to emphasize individuals' _____ while ignoring their _____.
    a. lifestyle and faults/personality and identity
    b. identity and personality/disability and weaknesses
    c. deficits and weaknesses/disability and personality
    d. disability and weaknesses/personality and lifestyle

20. Persons with severe disabilities are characterized primarily by their _____.
    a. ingenuity
    b. character
    c. identity
    d. appearance
    e. deficits

21. What does IDEA stand for?
    a. Individuals Disabilities and Ethics Act
    b. Individuals with Disabilities Education Act
    c. Individualized Disabled Education Action
    d. International Discussion on the Education of All Students

22. Which term is not included by IDEA as one of the categorical definitions of disability identified in federal regulation?
    a. severe disabilities
    b. autism
    c. mental retardation
    d. serious emotional disturbance

23. According to IDEA, because of the intensity of their physical, mental, or emotional problems, children with severe disabilities need highly specialized _____ services in order to maximize their full potential for useful and meaningful participation in society.
    a. familial, social, psychological, and educational
    b. social, medical, educational, and rehabilitation
    c. education, social, psychological, and medical
    d. rehabilitation, familial, social, and psychological

24. A person who has received a dual diagnosis has what types of disorders?
    a. mental retardation and an affective disorder
    b. psychomotor affect disorder and a behavior disorder
    c. schizophrenia and oppositional defiant disorder
    d. behavior disorder and mental retardation

25. What percentage of people diagnosed with retardation also have a serious emotional problem?
    a. 5-15%
    b. 15-75%
    c. 25-90%
    d. 50-70%

26. Which suggestion was *not* made by TASH in order to help deal with confusion over use of the dual diagnosis label?
    a. group based programs
    b. additional research
    c. reduced emphasis on labels
    d. individualize, personalized services

27. The relationship between severe retardation and emotional disturbance is _____ that between retardation and physical disabilities.
    a. understood better than
    b. not understood as well as
    c. understood equally as well as

28. Deafness-blindness is an example of a _____.
    a. dual diagnosis
    b. dual impairment disorder
    c. sensory enhancement disorder
    d. dual sensory impairment

29. The concomitant vision and hearing difficulties exhibited by people who are deaf-blind result in severe _____ difficulties.
    a. familial, developmental, and social
    b. familial, developmental, and educational
    c. communication, developmental, and educational
    d. communication, developmental, and physical

30. According to Downing and Eichinger, individuals with deafness-blindness often exhibit socially _____ behavior.
    a. inappropriate
    b. appropriate
    c. aversive
    d. unusual

31. What was Morris Mason diagnosed with?
    a. dual sensory impairment diagnosis
    b. schizophrenia alone
    c. dual diagnosis of mental retardation and metal illness
    d. oppositional defiant disorder

32. Morris Mason was diagnosed with an _____ reactions.
    a. IQ of 90 and schizophrenic
    b. IQ of 110 and oppositional defiant
    c. IQ of 66 and schizophrenic
    d. IQ of 66 and oppositional defiant

33. Virginia law requires the transfer of any prisoner diagnosed as insane to a _____.
    a. maximum security prison
    b. minimum security prison
    c. outpatient treatment facility
    d. mental health facility

34. According to Virginia law, who is responsible for initiating a sanity hearing in the case of a condemned prisoner?
    a. the prison warden
    b. the prisoner's lawyer
    c. the prisoner
    d. the prisoner's power of attorney

35. It is estimated that between ____ and ____ of the US general population has severe and multiple disabilities.
    a. 1.0% and 2.0%
    b. 0.1% and 1.0%
    c. 1.5% and 2.5%
    d. 0.5% and 1.5%

36. Over _____ students are considered eligible for services under IDEA.
    a. 10 million
    b. 7 million
    c. 5 million
    d. 3 million

37. Overall, about _____ individuals in the United States are identified as deaf-blind.
    a. 26, 000
    b. 22, 000
    c. 18, 000
    d. 14, 000

38. Which are considered potential causes of birth defects?
    a. Chromosomal abnormalities
    b. Metabolic disorders
    c. Phenylketonuria
    d. All of the above
    e. None of the above

39. Severe and multiple disabilities can result from incidents occurring late in life such as _____.
    a. poisoning and accidents
    b. accidents and malnutrition
    c. malnutrition and physical neglect
    d. physical neglect and emotional neglect
    e. all of the above

40. School-aged students with severe and multiple disabilities should be characterized according to their _____ needs.
    a. instructional
    b. social
    c. familial
    d. physical

41. Most individuals with severe and multiple disabilities have _____ as a primary condition.
    a. oppositional defiant disorder
    b. mental retardation
    c. schizophrenia
    d. social phobia

42. Instruction in _____ skills is the most effective approach to academic learning for persons with severe and multiple disabilities.
    a. basic
    b. academic
    c. social
    d. functional

43. For individuals with severe and multiple disabilities, the learning of new skills is always paired directly with _____.
    a. old skills
    b. basic skills
    c. environmental stimuli
    d. previously learned

44. People with severe and multiple disabilities generally have an absence of _____ oral language.
    a. functional
    b. expressive
    c. a and b
    d. neither a or b

45. Poor muscle tone is often exhibited in conditions such as _____.
    a. epilepsy and diabetes
    b. spasticity and epilepsy
    c. atheotosis and diabetes
    d. atheotosis and hypotonia

Appendix K: Post-Study Questionnaire – Original Layout Version

Post-Study Questionnaire

The following questions relate to the passage you just read in the study:

Please rate the clarity of the material you read in terms of content.

1 2 3 4 5 6 7
extremely clear clear extremely unclear

Please rate the clarity of the material you read in terms of layout.

1 2 3 4 5 6 7
extremely clear clear extremely unclear

Have you ever taken a class in which this text material was used?

Have you ever taken Psychology 322 (Psychology of Exceptional Children) at UNCW? If so, when?

Please describe/list any additional classes you have taken involving the study of people with severe and/or multiple disabilities.

Did you read the information in the 2 boxes that were in the reading material?

The following questions refer to the way in which you read and study textbook material in general:

Please rate the frequency with which you read the information presented inside boxes in textbooks.

1 2 3 4 5 6 7
Always Sometimes Never

Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material.

1 2 3 4 5 6 7
Very Helpful Somewhat Helpful Never Helpful

Please rate the frequency with which you read the preface and / or "Information for Students" at the beginning of a textbook.

1 2 3 4 5 6 7
Always Sometimes Never

If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.

1 2 3 4 5 6 7
Always Sometimes Never

If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.

1 2 3 4 5 6 7
Always Sometimes Never

If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.

1 2 3 4 5 6 7
Always Sometimes Never

If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.

1	2	3	4	5	6	7
Always			Sometimes			Never

Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.

1	2	3	4	5	6	7
Very Distracting			Somewhat Distracting			Never Distracting

Appendix L: Post-Study Questionnaire – Modified Layout Version

Post-Study Questionnaire

The following questions relate to the passage you just read in the study:

Please rate the clarity of the material you read in terms of content.

1 2 3 4 5 6 7
extremely clear clear extremely unclear

Please rate the clarity of the material you read in terms of layout.

1 2 3 4 5 6 7
extremely clear clear extremely unclear

Have you ever taken a class in which this text material was used?

Have you ever taken Psychology 322 (Psychology of Exceptional Children) at UNCW? If so, when?

Please describe/list any additional classes you have taken involving the study of people with severe and/or multiple disabilities.

The following questions refer to the way in which you read and study textbook material in general:

Please rate the frequency with which you read the information presented inside boxes in textbooks.

1 2 3 4 5 6 7
Always Sometimes Never

Rate the degree that you find information presented inside boxes in textbooks helpful in learning the material.

1 2 3 4 5 6 7
Very Helpful Somewhat Never
Helpful Helpful

Please rate the frequency with which you read the preface and / or "Information for Students" at the beginning of a textbook.

1 2 3 4 5 6 7
Always Sometimes Never

If outlines are presented at the beginning of chapters in a textbook, please rate the frequency with which you read them first.

1 2 3 4 5 6 7
Always Sometimes Never

If summaries are presented at the end of chapters in a textbook, please rate the frequency with which you read them first.

1 2 3 4 5 6 7
Always Sometimes Never

If review questions are presented after sections of text in a textbook, please rate the frequency with which you answer them.

1 2 3 4 5 6 7
Always Sometimes Never

If review questions are inserted at the end of chapters in a textbook, please rate the frequency with which you answer them.

1	2	3	4	5	6	7
Always			Sometimes			Never

Please rate the degree that you find information presented inside boxes in textbooks distracting to your learning the material.

1	2	3	4	5	6	7
Very Distracting			Somewhat Distracting			Never Distracting

Appendix M: Evaluation Questionnaire

Pilot Study Questionnaire

Please rate the amount of study time allowed.

1	2	3	4	5	6	7
Much Too Little			Just About Right			Much Too Much

Please rate the degree to which the quiz questions were worded clearly.

1	2	3	4	5	6	7
extremely clear			clear			extremely unclear

Did you find any individual questions worded poorly? If so, please specify.

How did you hear about this study?

a. Psychology 105
b. Campus flier
c. Psychologist/psychiatrist flier
d. Other:_____