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Relationship between Text Display Method and College Student Short Term Knowledge Retention during Self-Study.

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by

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ABSTRACT

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This purpose of this study was to determine if a significant difference existed in the short-term knowledge retention of college freshmen reading informational stimulus materials presented through one of three different text display modes; 1) traditional printed text, 2) computer-displayed linear text, and 3) computer-displayed hypertext. The sample consisted of 267 college freshmen at a southern regional university. The 267 students were randomly selected from the entire population of entering freshmen during Fall 2002. These students were then randomly assigned to one of the three treatment groups. After reading the stimulus materials for a specified amount of time, students completed a multiple-choice knowledge-based test that was designed by the researcher.

Analysis of variance (ANOVA) was used to compare scores on the knowledge test across the three different treatment groups. The analysis showed a significant difference in the scores of students in the computer-displayed hypertext and traditional printed text groups, with those reading traditional printed text scoring higher. There was also a main effect for gender, with females scoring higher on the knowledge test than males. There was no significant gender by text display method interaction These findings support the relative efficacy of presenting information to college students in a traditional printed text format under similar conditions.

DEDICATION

This work is dedicated to my wife

Dawn without whom I could never have survived the process.

This work is also dedicated to my parents

Otis and Jo Ann Church.

I credit them with teaching me to fulfill my goals.

ACKNOWLEDGMENTS

I would like to express my appreciation to the chairperson of my graduate committee, Dr. Russell West, and to my committee members -- Bill Hemphill, Dr. Louise MacKay, and Dr. Russell Mays. I also wish to give special thanks to Dr. Ron Lindahl, my previous graduate committee chair.

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CHAPTER 1

INTRODUCTION

Since Johann Gutenburg's invention of an effective printing press in the 1440s, the printed page has represented the standard for displaying text (Bunch & Hellermans, 1993). In education, everything from textbooks to students' syllabi has been printed information. Traditional education has been dominated by the printed word as a substantial source of information. Libraries, the great holders of printed information, are seen as the very symbol of knowledge. Academic journals, the foundation upon which much research is built, are also printed text.

In 1945, however, Varrevar Bush, Director of the Federal Office of Scientific Research and Development, wrote an article depicting his vision of the future. In his article, he described a machine called a Memex, which stored the content of hundreds of thousands of books in a reduced format that could be projected for the reader temporarily on a screen. It was his opinion that such a machine would make printed text obsolete (Bush). Unfortunately, at the time, the technology did not exist to put Bush's dreams into practice.

By the 1960s, however, technology was catching up. In 1967, the National Aeronautics and Space Administration (NASA) developed the File Retrieval and Editing System (FRES). This system created a set of linked computer files for the purpose of creating computer-based instruction manuals for the Apollo space missions and possibly, more importantly, put the reality of computer-based books in the public's eye. The FRES system did, however, require a mainframe computer to run, so even though this technology continued its slow but steady development, it stayed in the business environment (Yankelovitch, Meyrowitz, & Van Dam,

1991). In 1975, the Altair was introduced as the first home computer. Unfortunately, it lacked a very important component that would allow it to play a direct part in the evolution of computer-displayed text; it had no text display. It was not until 1977 that a home computer capable of displaying text became available. These early machines displayed text not in the manner of the FRES system but as long continuous documents with a set line length typically 80 or 120 characters wide. The documents resembled, to the best of their display's ability, traditional printed text in style and format (Ceruzzi, 1998). Then, in 1987, Bill Atkinson developed HyperCard. This program allowed personal computer users to display text in a way that allowed it to be searched and read on screen much like the FRES system. Shortly thereafter, many similar programs were developed giving users many choices and opportunities to experience the technology (Duval & Main, 1994). Then, in 1992, a program called Mosaic was introduced that used a new programming language called Hypertext Markup Language (HTML) and it was designed to transport and display text over networks. This developed into the World Wide Web and opened the floodgates for everyone, including those in education, to have easy access to computer-based text (Large, 1996). In this way, technology is changing the nature of the printed page.

Current State of Educational Technology

According to the Cost of Supporting Technology Services (COSTS) project in colleges and universities, the 2000-2001 academic year saw universities in the United States spending an average of 4.6% of their total budgets on various types of information technology, with some universities spending as much as 6.9% of their budgets. These numbers represent an increase of 11% from the 1999-2000 academic year (COSTS, 2001). In a study conducted by the Campus

Computing Projects, some of the results of this spending are shown. For example, in the year 2001, 82% of the public universities in the United States offered courses that were fully online. These are courses that make all course materials and instructions available only via some sort of link to the World Wide Web. For universities of all types in the United States, almost 40% of all classes had electronic course materials in 2001. For public universities surveyed, 100% had electronic course catalogs, 98.8% had electronic library card catalogs, 79.4% used electronic reserved reading materials, and 87.3% had electronic bookstore services (Green, 2001). In the 2000 survey, nearly 60% of all classes at the universities polled used email for class materials, over 40% used web-based resources, over 30% had class web pages, and over 40% had electronic handouts (Green, 2000).

The classroom is not the only place where the increase in electronic text is becoming apparent. The university library is also changing because of this technology. The library at State University of New York at Buffalo spent 5.2% of its total budget on electronic resources in 1991 but increased that expenditure to 32.3% of its total budget by 2001(Carlson, 2001). This represents a huge investment in money and overall resources for most university libraries in the United States. In addition, libraries are seeing a shift in their usage because of the change in text format. In 1991, the library at Augusta State University in Georgia had 388,000 patrons come in and use the library's print resources. In 2001, the number of patrons had dropped to 272,000. Many libraries are finding their computer labs packed and their study rooms and stacks deserted. The University of Idaho at Moscow has seen its book circulations drop by 20% since 1997 and reserve loans down by over 50%. In contrast, since 1999, electronic article access has grown by 350% and journal database searches by 800%. These trends are starting to force libraries to add amenities such as espresso machines, Starbucks coffee shops, and Krispy Kreme doughnuts to

encourage students to frequent the library. These types of changes, in turn, use up more resources destined for the purchase of traditional text materials because their purpose is more to attract patrons than to generate any extra revenue (Carlson).

The transformation to electronic text does not stop there. The university bookstore environment is also changing due to the introduction of reliable and affordable e-books. E-books are electronic devices that are often the size of a traditional paperback and only slightly heavier. These devices contain a storage medium and a display screen. They can hold the information for many books and display the information on demand, a method that hearkens back to Bush's Memex machine. E-book companies are now working closely with textbook manufacturers to increase availability while dropping prices. For the publishers, it is a winning proposition, because the cost of producing an electronic version of a textbook is considerably lower than that of a traditional printed text, leaving them the ability to maintain current prices while making more profit. Production time is also a big issue for book publishers and e-books dramatically cut that because the electronic version of a book can be transferred from place to place in a matter of minutes. This eliminates time spent printing, packaging, and shipping traditional books. In addition, particularly with the constant changes in textbooks, this allows for faster editing and changes for new editions. Professors are taking advantage of this benefit by working with publishers to customize textbooks to include material that they would normally have to put into course packets. The ease of e-book publication has even allowed some authors to bypass publishing companies completely. Author Stephen King recently released the e-book entitled Riding the Bullet free of charge. It was only available as an e-book and was not released in any printed format (Looney & Sheehan, 2001).

In a recent study at Fordham College at Lincoln Center, students were given an e-book instead of traditional text for an Introductory Biology class for non-majors. Of the 19 students in the study, 100% stated that they would recommend to a friend the use of an e-book for a college course. Ninety-five percent wished that their other courses offered e-books and 58% said an e-book option on a course would make them more inclined to take that course. In addition, 75% stated that they used the e-book in places they would not normally read a standard book and 84% said they did not mind the $200.00 price tag (Simon, 2001). Anyone doubting the trend toward electronic text must consider that in 1999 most e-books came from small start-up companies, whereas in 2001, established companies such as Microsoft and Adobe began controlling the field. Dick Brass, the executive-in-charge of Microsoft's e-book reader division, predicted that publishing will soon shift completely to the electronic format (Lynch, 2001).

Along with the proliferation of electronic resources, universities are also moving toward ubiquitous computing. The trend of requiring students to purchase computers, often laptops specifically, is putting even more pressure on professors, libraries, and book publishers to supply electronic resources. Some universities, such as Wake Forest University in North Carolina and Winona State University in Minnesota, have already begun requiring all students to purchase laptops and requiring electronic resources from their publishers and their faculty (Matthews, 2001; Olsen, 2001).

Electronic Formats for Displaying Text

In computer-displayed text there exist two basic electronic formats for display, computer-based linear text and hypertext. The first, computer-based linear text, is text that is displayed on the computer screen in such a way as to make it resemble, as closely as possible, the traditional

printed page. Computer-based linear text is characterized by fixed line widths and continuous pages, like those found in a book. It is read either by scrolling down the page in the case of one long document or selecting some version of a feature that simulates page turning. In this format, information is linked only from page to page, mimicking a traditional printed book (Gould & Grischkowsky, 1984).

The second method of display is hypertext. Ted Nelson coined the term 'hypertext' in 1965. He derived the word from the Greek word 'hyper,' meaning extended, and the Latin word 'text' meaning interwoven material. Nelson's vision was for a system that would allow users to make quick and easy transfers from one piece of information to the next related piece (Ceruzzi, 1998). This idea was an update of Bush's Memex machine from the 1940s (Duval & Main, 1994). The hypertext display type actually consists of several different layout concepts with a common theme of having cross-linked information. The main concept behind hypertext is taking many small blocks of information and connecting them together in an organized structure (Jonassen, 1986). These small blocks of information, known as nodes, form the fundamental units of a hypertext document and are made up of single ideas or concepts (Bieber & Kimbrough, 1992). The information in each node is ideally kept small enough to be displayed on one computer screen or less. The nodes are connected by electronic paths known as links or "hot links" and are the mode of transportation from one piece of information to another within a hypertext document (Gates & Sawhill, 1995).

Statement of the Problem

Until recently, printed text was the most widely used method of transmitting information for education. Many generations of people have used printed text as an integral part of their

education and many educators still balk at the idea that printed text could ever be replaced (Lynch, 2001). For reasons of cost, availability, and flexibility, among others, printed text is being exchanged for computer-based text. The format in which this computer-based text is viewed, whether linear or hypertext, could drastically affect its performance and suitability for education. Literature on traditional expository text states that well-structured text is created using the building blocks of well-structured paragraphs. These paragraphs are arranged in an order giving the text a structured flow or direction that encourages the reader to follow the flow or direction intended by the author (Garner, Alexander, Gillingham, Kulikowich, & Brown, 1991). This is the opposite of the Hypertext viewing method, which passes the control of the viewing order from the writer to the reader (Heller, 1990). The access or flow of hypertext information is believed by many to be closer to the manner of human thought than traditionally organized text (Esichaikul & Madey, 1994). According to Coleman, there is no real reason to offer text in electronic format unless it takes advantage of the possibilities of the hypertext non-sequential format (1993). Despite myriad opinions, however, educators, publishers, universities, and even libraries are rushing headlong into converting printed text into computer-based text with little solid information as to how the different formats affect the reader.

For universities, this transition to new methods of displaying information represents more than just an investment of resources. It potentially changes the way students perceive and interact with information. This change in learning by college students is not well-understood and must be studied further, using sound research methodologies.

The purpose of this study was to determine if there was a significant difference in short term knowledge retention among first semester, traditional-aged college freshmen who used different text display methods (hypertext, computer-based linear text, and traditional printed text)

in self-directed study. A secondary purpose was to determine of there were gender differences in short term knowledge retention and whether there was a gender interaction by text display method.

Research Questions and Associated Null Hypotheses

Four research questions were posed in this study. Because each of the questions involved the testing of statistical hypotheses, the hypotheses, stated in the null form, are presented under each question.

1. During short-term, self-directed study, is there a significant difference in short-term knowledge retention based on the text display method (printed text, computer-based linear text, or hypertext)?

   Ho1: There is no significant difference in test scores of students randomly assigned to different text display methods (printed text, computer-based linear text, or hypertext).
2. During short-term, self-directed study, is there a significant difference in short-term knowledge retention based on gender?

   Ho2: There is no significant difference in test scores of students based on gender.
3. During short-term, self-directed study, is there a significant gender by text display method interaction in short-term knowledge retention?

   Ho3: There is no significant difference in test scores of students based on a gender by text display method interaction.

4. Are there differences in item difficulties between students randomly assigned to different text display methods (printed text, computer-based linear text, or hypertext)?

   Ho4: There is no significant difference in the difficulty of test items between those assigned to different text display methods (printed text, computer-based linear text, or hypertext). It should be noted that this more general hypothesis represents 25 different hypothesis tests, one for each specific item on the 25-item test.

Significance of the Study

As education makes the rapid shift from printed text to computer-displayed text, it is critical to have solid research to compare the difference in learning between display methods. It is important to know not only how computer-displayed text compares to traditional printed text but also how computer-displayed linear text and hypertext compare. Conclusions from this study may provide textbook publishers, administrators, faculty members, and others involved in the process of education pertinent information on the differences in using the different display methods. As the review of literature shows, little true experimental data exist comparing these display methods, and even less data are available on its effect on college-level learning. This study may provide much needed experimental data that will help educators make informed decisions and lead researchers to stronger future findings.

Overview of the Study

In Chapter 1, the need for this research and the current state of transition from printed text to computer-displayed text are described. Chapter 2 consists of a review of literature related to learning with printed text, computer-displayed linear text, and hypertext. In Chapter 3,

the format and guidelines for conducting the study are described. The analysis of data is presented in Chapter 4. The final chapter, Chapter 5, includes the conclusions and recommendations of the study, for both practice and further research.

CHAPTER 2

REVIEW OF LITERATURE

This research is based on learning theory and the differences between printed text, computer-displayed linear text, and hypertext. The first part of the chapter focuses on the behaviorist, cognitive, and constructivist learning theories as related to text-based learning; this sets the stage for examining the results of other research. Secondly, this chapter explores the issues and research connected with computer-displayed linear text. Finally, an overview of computer-displayed hypertext and the corresponding research is presented.

Learning Theory and Technology

Learning theory is the way in which educators conceptualize the process of learning. It gives a framework for how information is absorbed and processed. It is, therefore, important to understand which learning theory is being used as a model for research to be able to better understand research outcomes. This research gives a brief overview of the three learning theories of behaviorist theory, cognitive theory, and constructivist theory to provide a framework for reviewing existing research. This framework helps to shows that all three of the theories use short-term memory as a starting place for learning.

Behaviorist Theory

The behaviorist theory of learning is a three-stage process. The first stage is the absorption by the learner of an external stimulus. In the second stage, the learner is evaluated on the information absorbed from the external stimulus. In the last stage, the output from stage two is reviewed. If the output is correct, there is a reward and this reward acts as incentive to move

on to the next stimulus event. If the output is incorrect, the initial external stimulus is repeated along with the rest of the process until the result is a correct output (see Figure 1).

Skinner (1958) wrote, "Audio-visual aids supplement and may even supplant lectures, demonstrations and textbooks. In doing so, they serve one function of the teacher: They present materials to the student and, when successful, make it so clear and interesting that the student learns." (p. 970). He wrote about the potential of this new theory in teaching technology. His idea, and the ideas of many behaviorists of the time, was to develop a machine that would give instant reward for positive events by the learner, thereby conditioning them to that reaction. Another behaviorist theory was that learning was considered to have taken place if there were noticeable changes in behavior (Semple, 2000). To that end, the Behaviorist concepts of drill and reward dominated early educational uses of computers. To this day, the ideas of pre-structured blocks of information followed by feedback, with rewards for success, still dominate computer-based tutorials as a procedural model (Boyle, 1997). The behaviorists were mainly concerned with external and observable behaviors with little focus on the mental processes involved.

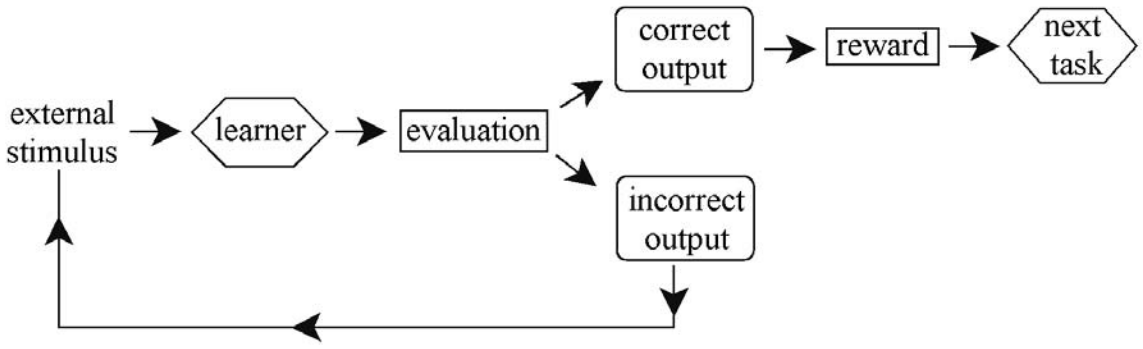

Figure 1. Behaviorist learning theory model: Shows the path of learning from external stimulus through a correct evaluation of the learning on to the next task.

Cognitive Theory

In time, a different approach emerged about the way in which people learned, the cognitive approach (Huitt, 2000). The cognitive learning theory views learning as an internal process of acquiring, remembering, and using knowledge. Proponents of this approach believe that only with a change in knowledge does behavior change (Woolfolk, 1993). A major concern of cognitive theory is on how memory works. The question of how facts are stored and retrieved is very important in learning theory. A prominent theory to explore this process is called Stage Theory (Atkinson & Shiffrin, 1968).

Stage theory states that external stimulus is stored in three stages. The first stage is sensory memory. In this stage, external stimuli are converted to electrical impulses that the brain can process. This stage of memory is very short, less than a few seconds. It is, nevertheless, very critical. If the learner does not complete this process, the information will not move on to the next stage but instead will be forgotten. The next stage is the short-term memory, also called working memory. This memory stage can hold from 3 to 7 items for 15 to 20 seconds (Atkinson & Shiffrin, 1968).

There are two major ways that information moves from the sensory memory to the short-term memory. This first is if the external stimulus is aligned with some intrinsic motivation with the learner that results in holding the learner's attention for the time of sensory memory processing. The second is the external stimulus that follows a known pattern already present in the long-term memory stage (Atkinson & Shiffrin, 1968).

To retain information in the short-term memory, there are two accepted concepts. The first is repetition, which is the idea that continual exposure of the short-term memory to the same

information will result in retention of the information for up to 20 minutes. The theory does say, however, that this repetition must be done after the information starts to leave the short-term memory to be forgotten. In other words, it must be re-entered into the short-term memory through the sensory memory repeatedly for it to effectively remain in the short-term stage. The second theory for how information stays in the short-term memory stage is organization. This concept is divided into four strategies. The first strategy is component, or the grouping of information into categories or concepts. The second strategy is relevance, which deals with grouping information by a common idea or topic. The third strategy is transitional, which is the grouping of information around common trends of thought. The first three strategies all relate to a process called chunking. Miller (1956), in *The Magic Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, explained chunking by saying:

> we must recognize the importance of grouping or organizing the input sequence into units or chunks. Since the memory span is a fixed number of chunks, we can increase the number of bits of information that it contains simply by building larger and larger chunks, each chunk containing more information than before. A man just beginning to learn radiotelegraphic code hears each dit and dah as a separate chunk. Soon he is able to organize these sounds into letters and then he can deal with the letters as chunks. Then the letters organize themselves as words, which are still larger chunks, and he begins to hear whole phrases. (p. 92)

It is critical to remember that the short-term stage can only hold three to seven units of information. The fourth strategy of organization is sequential. In this strategy, the information is grouped sequentially, building to a finale. An example of this would be a chronological process with a clear starting point, sequence of events, and a clear ending, such as driving a car in a race. In this strategy, the entire event can become one unit of memory.

The last stage of memory is long-term memory. This stage is where information is stored long-term for later recall (see Figure 2). Unfortunately, not all information stored in this stage is available for conscious recall at any given time.

There are two strategies for moving information from short-term to long-term memory. The first is periodic review, which is similar to repetition in short-term memory. The second is called elaboration. These strategies deal more with developing methods to trigger recall from long-term back into short-term memory. These include creating a mental picture, connecting knowledge to previously known objects, and connecting ideas to previously known words. Once information is transformed into long-term memory, it is organized into one of three structures to facilitate storage. The first structure is graphical, which is the process of storing information as pictures. The second type is procedural and is the storage of complete sets of activities as a sequential set of instructions. The final type is declarative; it typically involves the kinds of information that a person can articulate to others. This structure is further divided into two types of memory. The first is episodic memory, which includes personally experienced stories and events. The other type of memory is semantic, which includes facts and general knowledge, including relationships of ideas, sets of concepts, and rules, paradigms, models, and scripts (Atkinson & Shiffrini, 1968; Huitt, 2000; Miller, 1956; Semple, 2000; Woolfolk, 1993).

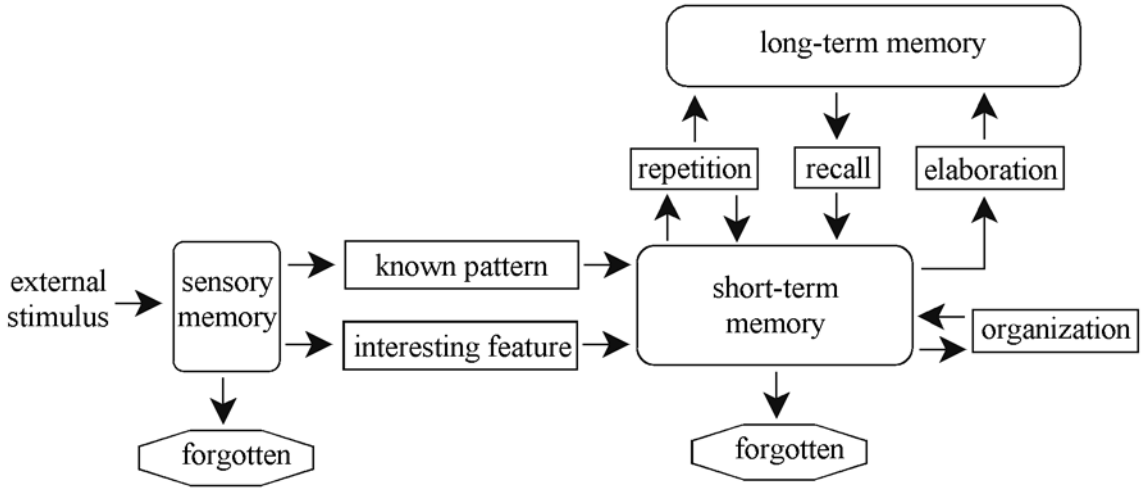

Figure 2. Cognitive learning theory model: Shows the path of information from external stimulus to long-term memory.

Constructivist Theory

Another learning theory with relevance here is called Constructivist Theory. This, according to Honebein (1996), is more of a guide of process of learning rather than a true theory for explanation of learning. In the constructivist process, the learner goes through four stages. The first is assimilation, which is the taking in of information. This is followed by accommodation, which is the comparison to pre-learned information. Then, the learner organizes the information to form patterns of behavior and, finally, the patterns are internalized into schemata (see Figure 3) (Semple, 2000). It is important to see that in constructivist learning, knowledge is in the mind of the learner and has to be constructed from the experience of the learner. Also, it must be recognized that without reflection about the knowledge by the learner, no learning is taking place (Greening, 1998).

In constructivist theory, it is important to keep in mind that the learner is viewed as an active learner who is not just passively responding to a stimulus, as in the behaviorist theory

model. In the constructivist theory, the learner is engaged in the process and actively struggles, works through, and tries to make sense of the material presented (Perkins, 1991).

The constructivist process leads to the cognitive flexibility theory. This theory deals with learning in ill-structured domains. In this theory, the learning environment allows multiple perspectives on the information allowing the learner to fit it into existing knowledge patterns. One major tenet of this theory is that knowledge must be presented in a way that freely allows interconnections of knowledge (Jonassen, Ambruso, & Olesen, 1992).

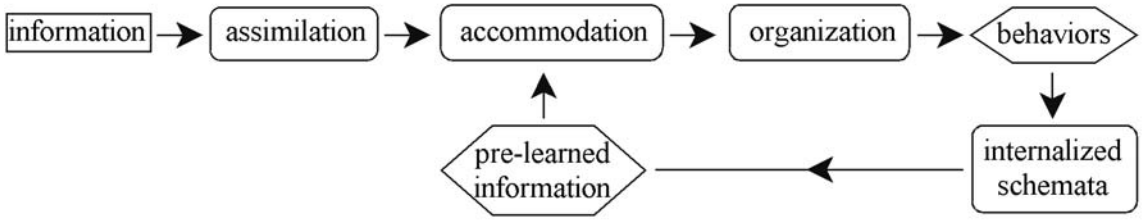

Figure 3. Constructivist learning theory model: Shows the path of information from assimilation to internalized schemata.

A Comparison of Computer-Displayed Text and Printed Text

Reading can be described as a complex and interactive two-stage process. Stage one deals with the text-based process or how information in the form of text is perceived. The second stage deals with the knowledge-based process or how information is processed after being perceived by the reader (Rumelhart, 1977). Traditional research on reading has often used these two stages as a basis for study. It is logical, when framing reading research, to begin by addressing the text-based process before looking at how the information is processed (Weisenmiller, 1999). This section of the literature review will use these two stages as a framework for exploring the pertinent research on the comparison of computer displayed text to traditional printed text.

The Text-based Process

This section will cover the issues of typography and human computer interface. To do this, the issues of luminance, contrast, resolution, fonts, flicker, letter case, and eye fatigue must be explored. It is important to keep in mind that all three learning theories discussed in the first part of this chapter begin with the external stimulus effectively entering the beginning stages of the process in order to succeed in learning.

Luminance. The human eye has two types of receptors that convert luminous energy into electrical signals that can be processed by the brain. The first receptor type is called rods, which primarily work in low-light conditions and differentiate between shades of gray. The second type of receptor is cones. They function in higher light conditions and mainly allow for the perception of colors. With this combination of receptors, the human eye can function over a large range of luminance. In print material, ambient illumination is reflected off the print medium and enters the eye as luminance energy, measured in Lux (Oborne, 1985). It has been found that the luminance from a printed page under normal house illumination levels matches that produced by modern computer screens (Gould, 1968; Laubli, Hunting, & Grandjean, 1981, Schmidtke, 1980). Subjects in a 1949 study were asked to identify letters from a chart with varying levels of illumination, the illumination range being from 1.076 Lux to 1076 Lux. It was demonstrated that ability to identify letters for subjects with normal vision increased steadily from 1.076 Lux to 10.76 Lux but, within the range of 10.76 Lux to 1076 Lux, the ability to recognize letters does not significantly change (Gilbert & Hopkinson, 1949). In 1981, Laubli, et al. in their exploration of computer monitors, found that these levels of illumination held true for computer monitors just as they had for reflected luminance from the printed page.

Contrast. Contrast is closely related to luminance in visual display. It is concerned with how well the eye, with an acceptable level of luminance, can distinguish between different letters. It has been shown that a negative contrast (dark letters with a light background) is significantly superior to a positive contrast (light letters with a dark background) (Oborne, 1985). It was found that by changing from a positive contrast to a negative contrast, the ability to successfully pick out nonsense words from a text increased by 23% while the speed increased by 8% (Bauer & Cavonius, 1980). This is a point of some concern with earlier research on reading with computer displayed text because early computer displays used positive contrast. Positive contrast is, however, no longer used as a primary means of display in computer displayed text.

Resolutions and Fonts. The process of displaying text on a computer monitor involves building each letter up with a series of dots. These dots are displayed on a grid and the density of the grid is a measure of resolution (Oborne, 1985). The measure of the size of this grid is done in the number of individual dots, known as pixels, per inch (ppi). Modern computer monitors have a standard ppi of 72, with some as high as 100 ppi. In contrast, the dots per inch used by most printers to produce printed text is in the 300 to 600 dots per inch (dpi) range (Weisenmiller, 1999). In comparing display resolution of both printed and computer displayed text, both were shown to improve reading and reader preference as the resolution increased (Journa, 1995). In addition to ppi, resolution is also affected by the amount of variation possible within each pixel on the screen. Older computer monitors could display one bit of information per pixel. That is, they could turn each pixel either on or off. With the introduction of the Video Graphics Array (VGA) in late 1980s, computer monitors could display up to 32 bits of

information per pixel. In other words, they could vary the color of each pixel by 16 million colors. This has the effect of being able to display text on screen to appear much smoother for the 32-bit displays over the one-bit (Tyson, 2001). A 1999 study of readability among 264 college students using the Nelson-Denny Reading Test found a significant improvement between text displayed at one-bit and at eight-bits. In the study, the students reading text displayed at eight-bits had significantly higher reading comprehension over the students reading the one-bit text. The same study showed no significant change in reading comprehension on reading speed between 8-bit computer displayed text and 600 dpi printed text (Weisenmiller, 1999).

Closely related to Resolution is the study of fonts. Fonts determine the pattern of dots that produce each letter in both printed and computer displayed text. Will-Harris, cited in Weisenmiller's 1999 work, suggested that fonts, such as Verdana and Georgia, produced specifically for display on computer monitors improve readability. Weisenmiller's study, however, found no such interaction between font type and reading comprehension or speed.

Flicker. Flicker is the blinking effect that is caused by the computer monitor adjusting each pixel on the screen. This is done a certain number of times per second. When any light is turned on and off, it appears to blink or flicker. If this is done fast enough, the human eye can no longer distinguish between the blinks and the light appears to remain on. This rate of blinking that is fast enough to fool the eye into believing the blinking has stopped is referred to as the critical fusion frequency (cff). The cff level differs from person to person but stays fairly stable for each person. It does, however, decrease as ambient illumination decreases. It is generally accepted that a refresh rate of 60 cycles per second is sufficient to overcome the cff (Oborne, 1985). Modern computer monitors are typically set to 75 cycles per second to avoid blinking at

the same rate or in unison with fluorescent lights used in most offices, which blink at 60 cycles per second (Tyson, 2001).

Letter Case. Letter case deals with the usage of capitalization in how text is displayed either on the computer monitor or on a printed page. It has been shown that font type plays no significant role in reader comprehension or speed (Weisenmiller, 1999). It has, however, been shown that the use of a combination of capital and lower case letters does improve reading speed. This is believed to be because the visual shape of the free space around words acts as an aid to readers. This is of particular concern for early studies in computer displayed text up to the 1970s because early computer monitors displayed all letters at approximately the same height (Oborne, 1985).

Eye Fatigue. There has been, for some time, much concern that computer displayed text causes excess eye strain as compared to printed text. A review of studies by Dainoff in 1982 showed that all the studies to that point reported significant eye fatigue due to the use of computer monitors. Dainoff noted, however, that there was a lack of validity and reliability in the instruments used, a lack of control groups, and a lack of appropriate sampling techniques in those studies (1982). In 1984, Gould and Grischkowsky studied 24 clerk-typists supplied by a temporary hiring agency. The participants were divided into two age groups, ages 20 to 27 and ages 40 to 61. The participants were tested for visual acuity with all showing corrected vision of at least 20/33, which was deemed acceptable for reading. Each group was asked to correct spelling errors in documents over six 45 minute work periods, filling out an eye fatigue survey at the end of each work period. In addition, the subjects were video-taped so the reviewers could

review the tape for signs of eye fatigue at a later time. For one day of the experiment, participants worked with hard copy and for the other, they worked on a computer display. A comparison of the reported fatigue between the two display methods found no significant differences for either group relative to display method. Comparing the rater's evaluation of the participants also supported no significant difference between the display methods. It was found that both groups reported eye fatigue, but the difference in the levels of fatigue was not significant. Gould and Grischkowsky (1984) theorized that any work dealing with concentrating on small details for any length of time would cause eye fatigue and that the computer monitor was not a direct effect. In another study in 1982, researchers found no significant difference in participants physical discomfort levels between those reading printed text and those reading liner text from a video screen. In the study 32 undergraduates were divided into two groups, one group read linear text from a video screen for two hours and one group read printed text for two hours. At the end of the experiment the subjects were asked to fill out a survey on their discomfort level using a seven point rating scale on their level of dizziness, headache, nausea, fatigue, and eye strain (Muter, Latremouille, & Treurniet, 1982).

It is important to note that both the Gould and Grischkowsky studies and the Muter, Latremouille, and Treurniet study, all were conducted in the early 1980s before the widespread use of the VGA computer monitor. These early monitors not only had lower resolutions but also, often, had slower refresh rates than modern monitors.

Knowledge-Based Process

The comparison of computer displayed text with print-based text looks at how well the material was comprehended by the reader. In Behaviorist theory, this is the evaluation step of

the learning process. For the Cognitive stage theory, it is a measure of how well the information can be held or recalled to short-term memory. In Constructivist theory, it is how well the information has formed schemata within the learner. In all three theories, the comprehension of material shows that the information successfully entered the learning process. In the eight studies of computer-displayed linear text compared to traditional printed text shown in Table 1, only one showed a significant effect on comprehension due to display type, reporting that in that study the printed text was significantly better for text comprehension. Two studies also reported significantly better reading rates for paper over computer-displayed text. Even when looking at variables of text contrast and letter case, the overall body of research shows that no significant difference in reading comprehension is found between printed text and linear-displayed computer text. These results are not surprising when observing the way the medium is being used in connection with the learning theories. In all the studies reviewed, computer-displayed linear text played the same role as printed text in relation to each of the three learning theories. The effect on learning was not changed simply by a change in medium (Clark, 1983).

Table 1

Studies of Computer Displayed Linear Text Compared to Traditional Printed Text

Author	Sample	Contrast	Capitalization	Other variables	Findings
Swanson Trahan (1992)	120 4th through 6th Graders	Positive	NA	Reading ability Working memory	No significant difference Better reading
Fish Feldmann (1987)	36 doctoral 23 masters students	Positive	All caps	Age, sex Experience with computers	No significant difference
Rice (1994)	120 graduate and undergraduate students	NA	Some text in all caps	Computer aptitude	No significant difference
Reinking Schreiner (1985)	104 5th and 6th Graders	Positive	NA	Reading ability	No significant difference
Muter Latremoulle Treurniet (1982)	32 undergraduate students	Positive	Both cases used	Horizontal spacing of letters	No significant difference Better reading speed for print
Heppner Anderson Farstrup Weiderman (1985)	85 students, faculty, and staff at a university	Positive	Both cases used	Age Average TV viewing time Reading time Reading speed	Better comprehension for print
Weisenmiller (1999)	22 undergraduate students	Negative	Both cases used	Font type Resolution	No significant difference Better reading
Moore Zabrucky (1985)	80 adults	Negative	Both cases used	Age	No significant difference

A Comparison of Hypertext with Linear Text

This final section of the literature review compares hypertext with the linear forms of both computer-displayed and traditional printed text. This will be done by first defining hypertext and then reviewing the research comparing it to linear text.

Hypertext

Hypertext, in its basic form, is the interconnection of sections of information, known as nodes, through the use of links. Nodes, the fundamental unit of hypertext document, are made up of single ideas or concepts (Bieber & Kimbrough, 1992). Ideally, the information in each node is divided into units small enough to be displayed on one computer screen or even a small part of one screen. These nodes correspond to what behaviorists call chunking. In a 1983 study of the use of chunking with computer displayed information, 30 fifth-grade students of above average reading ability read a section of text in linear format and a section of text broken into nodes, answering reading comprehension questions on each section. Using a t-test for correlated means, it was found at the .05 level that chunked text was better than linear text for reading comprehension (Gerrell & Mason, 1983).

The nodes are connected by electronic paths known as links and are the mode of transportation from one piece of information to another within a hypertext document (Gates & Sawhill, 1995). They permit access to information in a way that is more comparable to the way the human brain works than traditional text permits (Esichaikul & Madey, 1994).

These hypertext documents are referred to as non-linear documents, because the viewer does not move through the information in a straight line. Traditional text is linear and, therefore, encourages the reader to move in a straight line through the information by reading it from start

to finish. Hypertext documents also have many other differences from traditional paper documents. Literature on traditional expository text stated that well-structured text is created using the building blocks of well-structured paragraphs. These paragraphs consist of a topic sentence at the beginning and several subsequent sentences that support the topic sentence. These paragraphs are then arranged in an order giving the text a structured flow or direction that encourages the reader to follow that flow (Garner, Alexander, Gillingham, Kulikowich, & Brown, 1991). This type of well-structured text has been shown to be easier to read than illustrated text (Garner & Gillingham, 1987). Hypertext, however, passes control of the order of viewing a document from the writer to the reader (Heller, 1990). Therefore, the information must be organized and presented in small portions, allowing the viewer to determine the order and path of discovery (Large, 1996). This access or flow of information is closer to the manner of human thought than the organization of traditional text (Esichaikul & Madey, 1994). There is no real reason, according to Coleman, to offer text in electronic format unless it takes advantage of the possibilities of the hypertext non-sequential format (Coleman, 1993). This is a big change in the way people are accustomed to receiving written information and, as is often the case, change brings with it apprehension. One concern raised by McAdams is that people might lean more strongly toward existing print conventions instead of letting them go in favor of the new capabilities of hypertext (McAdams, 1994). If this is the case, then a compromise of some sort may be necessary. Most importantly, educators must understand the differences, both in abilities and in learning methodologies, between hypertext and traditional text in order to successfully create and utilize hypertext documents (Tovey, 1998).

In a 1994 review of research, 66 studies of hypertext were compared. Of these studies, nine dealt with a comparison of computer-displayed hypertext with linear text in either printed

form or computer-displayed form. The results of these studies as reported by the review are shown in Table 2. Of the nine studies, six show that hypertext significantly improved comprehension over linear text. In addition, the studies observed the learning domain. For the domain of statistics, home economics, social studies, general science, and human factors, hypertext was reported to increase comprehension over linear text. This difference was found to be significant in all but the human factors domain. None of the studies reported random samples for their participants, calling into question the effects the sample selection may have had on outcomes (Alexander, Kulikowich & Jetton, 1994). This is exacerbated by the fact that, even with the poor sample methods, only two of the nine studies used a pretest/posttest design. The other seven opted for a posttest only method. This further calls into question the validity of the findings.

Hypertext can be divided into three forms. The first form assumes all nodes within the document are records in a database and establishes links to connect the different records. This form limits the number of links connecting each record, therefore, making this form the most constrained. The second form connects each word within a node to every other use of the word within other nodes. This form can lead to confusion as viewers follow one link after another moving further from the original node. The final is a combination of the first two forms. In this form, the main topic points or significant words are linked to related nodes. The selection of these nodes is based on their relation to the starting point of the link (Gillingham, 1993). Harris, in a 1990 study, used the topic link model for the basis of the study.

Table 2

Alexander, Kulikowich, and Jetton's Comparison of Studies Comparing Computer-displayed Hypertext with Linear Text in Either Printed Form or Computer-displayed Form

Author	Domain	Participants	Pre/post design	Outcome on comprehension
Faircloth (1984)	Home economics	68 students	pretest posttest	Significant difference for hypertext
Egan, Remde, Laudauer, Lochbaum, Gomez (1986)	Statistics	20 university students	posttest	Significant difference for hypertext
Salomon, Globerson, Guterman (1989)	Literature, science, current affairs	74 7th graders	posttest	Significant difference for hypertext
Dillon	Human factors researchers	8 professional	posttest hypertext	Six of the eight did better with (1991) Difference found not significant
Gray, Barber, Shasha (1991)	Social studies	80 undergraduates	pretest posttest	Significant difference for hypertext
Carlsen, Andre (1992)	Science	83 undergraduates	posttest	Significant difference for hypertext
Guthrie, Mcpherson (1992)	Biology	45 undergraduates	posttest	Scored higher based on hypertext Difference found not significant
Morrell (1992)	Biology	110 High school	posttest	No significant difference found
Yang (1992)	Social studies	52 11th graders	posttest	Significant difference for hypertext

In the study, 156 undergraduate students served as the participants. Unfortunately, Harris used pre-existing freshman level computer classes to select the participants. The outcome of the study was that no significant difference was found for comprehension between hypertext and printed text (Harris, 1990). This leads to concerns of sampling methods in that the students selected may have had a pre-disposition for learning styles that did not support this style of hypertext. This final form is the model for hypertext that will be used for creating the documents to be used in this research.

Jonassen compared hypertext to cognitive conceptions of learning. The major similarity between the two is that they both link information by association allowing learners to make cognitive networks of new information and to combine this new information into pre-existing knowledge networks (Large, 1996). In addition, hypertext has been shown to share many of the characteristics that are associated with both discovery learning and incidental learning (Heller, 1990). Merrill (1975) also stated that discovery and incidental learning modes are both critical to giving students control over their learning so they may achieve better learning methods. In this manner, hypertext encourages learners to develop new cognitive methods to organize information, as hypertext basically opens up the students' ability to control their own learning (Large, 1996). These cognitive methods also differ by gender. There is a difference in learning characteristics, verbal behaviors, cognitive styles, and group orientation between genders (Damarin, 1988). There was, however, no significant difference found by gender in comprehension of the material in Harris' 1990 study comparing hypertext with linear text.

There has been some study of the effects of hypertext on learning and learning methods. One such study, conducted by Heyer, found that students typically follow one of three ways of

collecting information within a hypertext document. Heyer labels these three methods as "hunting," "browsing," and "grazing" (as cited in McAdams, 1994).

Heyer uses the term "hunting" to describe the act of searching a Hypertext document with specific terms or concepts in mind. In another study, Weyer (1982) found that when readers search a hypertext document for specific information they start by looking for key words or phrases. If this produces no results, the readers tend to fall back on simply reading and re-reading sections regardless of their degree of helpfulness. This re-reading has, however, produced positive results. According to Gillingham, adults who read a hypertext on Stephen Hawking, cosmologist and victim of Amyotrophic Lateral Sclerosis, had some difficulty in answering three two-part questions. Those readers who chose important text nodes more often and read them relatively longer were more successful in answering the questions than the unsuccessful readers (Gillingham, 1993).

Heyer labeled the second type of search method as "browsing." Browsing is defined as the act of searching a hypertext document with no specific end in mind (Heller, 1990). This technique is seen as a method of establishing the size and scope of a document. This is not always an accurate measurement because browsing is a very informal search method and can cause users to overestimate the percentage of nodes that they have viewed (Heller, 1990). Marchionini demonstrated that high school students typically only use browsing techniques to search a hypertext document. He found that they move from node to node in an informal manner based on perceived value of the links followed. This method requires less contact with the information in each node than would be required with an organized review of the documents (Heller, 1990).

The final method of searching is called "grazing." This is the most passive of the three techniques. In fact, it is much like watching television and changing frequently from one channel to another, with only very short pauses on any one channel. Users employing this search method simply move from one node to another with no basis for following any particular link (McAdams, 1994).

When employing either the hunting or browsing method, the user can follow one of three search models. These are depth-first, breadth-first, and the four-part model. The depth-first model shows that the reader explores each node fully and then selects the links to follow based on the information need compared to information available. Gillingham found that readers who use the depth-first approach to searching Hypertext documents had a higher comprehension of the material than those who employed the breadth-first model did. The second model is the breadth-first model, which has the reader scan the nodes to determine the quantity of information available and return to further examine the nodes with the most potential information. This model does, however, tend to cause a cognitive overload, as the reader gets lost following too many links to different nodes. The final model is the four-part model. It is comprised of four steps: goal formation, category selection, extraction of information, and the assimilation of the information. In the first stage of goal formation, the reader clearly defines the need for information. The second step is to select potential routes through the nodes to find that specific information. Upon finding the information, the reader then processes the information. This method has the best structure of the three but is useful only in instances where there is a clearly defined goal (Gillingham, 1993).

Barth stated that hypertext is the third greatest technological advance in writing, following the alphabet and moveable type (1997). Its effects on learning have been studied in

detail and have shown mixed results. One outcome is the theory that hypertext's learner-controlled documents produce a better educational experience and more learning. Steinberg, however, stated that, in some studies, students scored lower on tests when given control over instructional sequence. In other research, a best learner controlled sequence was equal to predetermined text sequence and some found no significant difference between learner controlled and predetermined order of text learning methods (Steinberg, 1989). Colamaio found in his studies on college students that they showed equal learning with both learner controlled and predetermined text (Large, 1996). MacArthur and Haynes conducted research on two groups of 10 students each. The students were grades 9 to 10, with identified learning disabilities. Each group was given a science lesson. One group had a hypertext-based lesson and the other group had a lesson using computer-based linear text. The students were interviewed to assess the comprehension of the information. The results showed that 9 of the 10 students in the hypertext group showed improved comprehension over the students in the linear text group (1995). In Steinberg's work, he did, however, determine that hypertext had a detrimental effect on the performance of students who were already performing poorly.

McGrath investigated to see if students who had the option of using the functions of hypertext during a computer-based learning session would take advantage of that available option. The study used 103 undergraduate students enrolled in a teacher-preparation course. The students were broken into groups and given computer-based instruction on how to calculate the surface area of regular and irregular solids. As the students viewed the lesson, their response patterns were observed. The students' different methods of searching were recorded and compared to their scores on a special relationship test. The study found no differences in scores based on search methods (McGrath, 1992).

Summary

Although research on hypertext has mixed results, it is important to note the lack of credible research methods in the existing literature. An unfortunate number of the existing studies lack random sampling techniques, with most using convenience samples and, to compound this problem, many lack pretest/posttest designs to help control external variables. In addition, the majority of the studies were done in the early days of hypertext integration, so the effect on students' ability to use it because of the technology becoming more common is unknown. In the early 1990s, Internet growth was in the 100% per year range with the growth rate peaking out at about 1000% in 1997. It is now back down to the 100% per year range (Coffman & Odlyzko, 2001). With this rate, much of American culture has daily exposure to hypertext (Large, 1996). Students see it as they register for classes, do research, attend class, and even shop. With this in mind, it is possible that students now possess better skills to cope with hypertext and, therefore, may be significantly different from students studied in previous research.

CHAPTER 3

METHODOLOGY

This purpose of this study was to determine if there is a significant difference in short-term knowledge retention among first semester, traditional-aged college freshmen who use different text display methods (hypertext, computer-based linear text, and traditional printed text) in self-directed study. A secondary purpose is to determine if there are gender differences in short term knowledge retention and whether there is a gender by text display method interaction. A posttest only control group design (Campbell & Stanley, 1963) was used in the study. This chapter includes a description of the research design, population, sample, instrument, materials, procedure, and data analysis.

Research Design

The posttest only control group design was chosen to establish a causal relationship among the three text display methods, gender, and short-term memory in a randomly selected and randomly assigned group of college freshmen. This represents what Campbell and Stanley (1963) considered a true experimental design. Even though many feel pretest-posttest design is necessary, pre-testing is not needed for true experimental designs or to establish a causal relationship (Campbell & Stanley), because the groups for this study were both randomly selected and assigned. The use of pretest was actually considered unnecessary and inappropriate, due to the possibility of pretest-posttest interference.

Population

The population for this study consisted of incoming freshmen at a public southern university. This regional university had an overall Fall 2002 enrollment of 13762. The incoming freshman class consisted of 2418 students, with 47.5 % males and 52.5 % females. The average high school grade point average for the population was 3.64 with a predicted college grade point average of 2.78. The average SAT score was 1111.

Sample Methods and the Sample

A random sample of 300 was selected from the population. The Office of Institutional Research generated the random sample from the computer Student Information System. This random sample function is a part of the Student Information System program made by SCT Corporation. This same function of the program randomly assigned the sample into three groups of 100 each. Of the sample for each group, Group One had 86% participation, Group Two had 97% participation, and Group Three had 84% participation.

In Table 3, the sample is compared to the total population on some benchmark characteristics. As shown in the table, the random sample closely matched the total population on these benchmark characteristics.

Table 3

Comparison of Population with Sample Participating in the Study on Benchmark Characteristics

Demographic criteria	Total Population	Sample
n	2418	267
Percent Males	47.5	50.9
Percent Females	52.52	49.1
Average High school Grade Point Average	3.68	3.64
Average Predicted College Grade Point Average	2.81	2.78
Average SAT score Math and Verbal Total	1111	1111
Percent out of State Students	13.4	15.0
Percent of in State Students	86.6	85.0
Percent African American	4.5	2.6
Percent Asian	1.6	2.6
Percent Caucasian	90.0	88.0
Percent Hispanic	1.6	2.6
Percent Non-Resident Alien	2.1	4.1

Instrumentation

The instrument for this study was a multiple-choice knowledge-based and researcher designed test. The process of developing the instrument began with the writing of 50 multiple-choice questions based on Section 14, pages 365-395 of Feldman's *Power Learning: mastering the skills to become an expert student*, published in 2002 by McGraw Hill. The questions were written to look for knowledge level information. The questions were then reviewed by two content specialists who were familiar with the Fieldman text. Additionally, the questions were reviewed by an assessment expert for structure. After the suggested changes and deletions, recommended by the three experts, were completed, a 40-question instrument was compiled. The instrument was then pilot tested using 40 second semester freshmen during spring, 2002.

The sample for the pilot test was a convenience sample of freshman seminar classes at the same university in which the final study was conducted. The freshman seminar class is designed to help students adapt to college. These students were not part of the population sampled for the final study, because they were freshmen in the preceding academic year. After the pilot test, any question that had no correct answers or had all correct answers were dropped from the instrument. This resulted in 25 questions in the final instrument. An additional question was added to assess the participants reported level of effort in the study and the participants were also asked to indicate gender. The final instrument is provided in Appendix B. A reliability analysis was done on the instrument after the study. The reliability coefficient for the instrument was an Alpha of .5573.

Materials

The three groups each received a different text display method based on Feldman's 2002 *Power Learning: Mastering the skills to become an expert student*, Section 14 pages 363-395. All three display methods kept several common characteristics.

1. Twelve point Times New Roman text
2. Black text with white background
3. Double-spaced lines
4. Seven-inch wide display area
5. Identical content (no words were added or deleted except for navigation links in the hypertext version)

Group 1 Computer Displayed Linear Text

The text was displayed using Dell OptiPlex GX150 computers with 17 inch monitors set at 1024 by 768 resolution with a 75 hertz refresh rate. Netscape 6.2 was used to display the text on the monitors. A Java script program was used to set the screen size at seven and a half inches wide and nine inches tall. The seven and a half inch width gave seven inches of display area and a right hand side scroll bar. The scroll bar was used to move up and down the text. The Java script also allowed all other functions of Netscape to be disabled. These functions included the location bar, the navigation tools, and the ability to open up new windows or resize the window. The ability to open other programs during the study was blocked at the server level.

Group 2 Computer Displayed Hypertext

The text was displayed using Dell OptiPlex GX150 computers with 17 inch monitors set at 1024 by 768 resolution with a 75 hertz refresh rate. Netscape 6.2 was used to display the text on the monitors. A Java script program was used to set the screen size at seven and a half inches wide and nine inches tall. The seven and a half inch width gave seven inches of display area and a right hand side scroll bar. The scroll bar was used to view text that went beyond the nine inches tall area of the screen. The Java script also allowed all other functions of Netscape to be disabled. The included the location bar, the navigation tools, and the ability to open up new windows or resize the window (see Appendix C). Words within the text and outlines of headings found within the original text were used as hyperlinks between the chunks of text. The text was broken down into logical chunks according to guidelines used by Harris in his study, *Hypertext vs. linear text as a learning tool* (1990). This section had the words ‘back’ added to the pages,

allowing participants to navigate back to previous pages. This was done because all other navigation tools within Netscape were disabled. Hyperlinks in this display method were colored blue to indicate to the participant that they were links. All other text remained black. This matches accepted hypertext conventions (Smith & Drakeley, 1998). The ability to open other programs during the study was blocked at the server level.

Group 3 Traditional Printed Text

The text was printed using an offset press on 20 pound white paper in 12-point Times New Roman font. The pages were set at seven inches wide with a ¾" margin and were printed only on one side of each sheet. The sheets were bound with a single staple in the top left corner and contained a blank, colored cover and back sheet.

Groups one and three were run simultaneously and group two was run once the computer lab used by group one was cleared and the computers reset. All three groups were run between one and three P. M. The lighting, ventilation, seating, and desk height was consistent throughout the study.

Procedure

The subjects selected for the study were sent a letter explaining the study and letting them know the time and place to report. It also served as their admittance ticket to the study. The study was conducted as part of the University Assessment Day. Assessment Day is a university sponsored testing day when classes are cancelled so the students can participate in a variety of assessments. As the participants arrived at their assigned times and rooms, proctors asked for letters of admittance and checked identification against a list of students selected for the study.

After the proctors confirmed that the participants were at the correct place, they were allowed to sit at any test location. This insured that no connection could be made between individuals and their test packets.

Once all participants were seated, proctors read a short statement explaining the nature of the study, how the findings could help future students, and that participation was voluntary. The proctors explained that in order to opt out of participation at any time during the test, the students could raise their hands and the proctor would retrieve their testing materials and they would be allowed to leave. An informed consent statement was also printed on the test booklets. Once the statement was read, students were given 45 minutes to read over the text in the format for their group. The text for the linear text paper group and the linear text computer displayed group consisted of 8586 words, with 8598 words in the Hypertext group. The extra text was for the addition of navigation links in the Hypertext version. The time of 45 minutes was decided based on a 200 words per minute average reading rate for optimal recall of information by college level students (Meyer, Talbot, & Florencio, 1999). After the reading time expired, participants were instructed to turn over the test booklet or turn off their computer monitors, depending on which section they were in. The participants were then given the test booklets and score sheets. Participants recorded their answers on computer scoreable bubble sheets using the No. 2 pencils provided. They were given 12 minutes to complete the test. At the end of 12 minutes, participants were instructed to stop the test and close their test booklets. Then, they were given an additional question asking them to evaluate on a Lickert scale the amount of effort they put into the study. The study materials were then gathered and the answer sheets were delivered to the University Scoring Center to be scored. The sheets were scanned with an optical computer

scanner and the resulting data were then entered into SPSS 11.0 for Windows for statistical analysis.

Data Analysis

This study describes the relationship between three text display methods and short-term retention of knowledge based information. A 3 (Text Display Group) x 2 (Gender) factorial analysis of variance (ANOVA) was used to answer research questions 1-3 and test null hypotheses 1-3. When significant main effects were found, Scheffe's Post Hoc Multiple Comparison tests were used to examine pair wise differences. In answering research question 4, Chi Square tests of independence were used to determine if there were differences in the proportion of correct responses across each of the three text display methods.

This chapter included information about the research design, population, sample, instrument, materials, procedures, and data analysis. Chapter four presents an analysis of data and Chapter five includes the findings, conclusions, and recommendations for further consideration.

CHAPTER 4

ANALYSIS OF DATA

With more and more resources being used in education to convert traditional printed text to computer-displayed text, it is important to understand how this change in text display method affects learning. The purpose of this study was to determine if there was a significant difference in short-term knowledge retention among first semester, traditional-aged college freshmen who used different text display methods (hypertext, computer-based linear text, and traditional printed text) in self-directed study. A secondary purpose was to determine of there were gender differences in short term knowledge retention and whether there was a gender by text display method interaction.

The participants of this study were randomly selected from 2418 incoming freshmen at a regional public Southern university. Table 4 shows the number of subjects who successfully completed the study and the number of females and males.

Table 4

Distribution of Study Participants by Gender

Group		Females	Males
	n	*n*	*n*
Computer-displayed linear text	86	42	44
Computer-displayed hypertext	97	40	57
Traditional printed text	84	54	30

As shown in the table, there were more participants in the computer-displayed hypertext group (n=97). The highest number of males was in the computer-displayed hypertext group (n=57), while the largest number of females were in the traditional printed text group.

There were four research questions in the study. A null hypothesis was associated with each question. The subsequent discussion will present the results as a series of responses to these research questions and null hypotheses.

Research Question 1

During short-term, self-directed study, is there a significant difference in short term knowledge retention based on the text display method (printed text, computer-based linear text and hypertext)? The associated null hypothesis is given below:

Ho1: There is no significant difference in test scores of students randomly assigned to different text display methods (printed text, computer-based linear text, and hypertext).

A summary of means and standard deviations for each group is shown in Table 5.

Table 5

Descriptive Statistics for Each of the Text Display Method Groups (All Participants)

Group	*n*	*M*	*SD*
Computer-displayed linear text	86	18.03	2.776
Computer-displayed hypertext	97	17.25	3.031
Traditional printed text	84	18.77	2.476

The main effect ANOVA for text display method yielded a significant difference between the groups (F=5.637, df =2,261, p=.004). The null hypothesis was rejected. A Scheffe' post hoc

test was then run to test look for pair-wise differences. These results are shown in Table 6. The post hoc testing revealed a significant difference between those in the computer displayed hypertext and traditional print text groups (p=.001). This indicated that those exposed to the traditional printed text scored higher than those in the computer displayed hypertext group.

Table 6

Summary of Post Hoc Tests in Response to Research Question 1 (All Participants)

Groups	*p*
Computer-displayed hypertext and Traditional printed text	.001
Computer-displayed hypertext and Computer-displayed linear text	.163
Computer-displayed linear text and Traditional printed text	.226

The study also examined the effect that participants' effort level on the test had on the significance of the interactions between the groups. The participants' results were filtered to remove the results of participants who reported little or no effort on the study. Table 7 shows the summary for the groups after those records were removed.

Table 7

Descriptive Statistics for Each of the Text Display Method Groups (Participants Reporting Some or A Lot of Effort)

Group	*n*	*M*	*SD*
Computer-displayed linear text	79	18.03	2.787
Computer-displayed hypertext	84	17.62	2.578
Traditional printed text	77	18.99	2.308

The main effect ANOVA for text display method yielded a significant difference between the groups (F=4.755, df =2,234, p=.009). Scheffe's post hoc test multiple comparisons test was then run to test for pair-wise differences. These results are shown in Table 8. The post hoc testing revealed a significant difference between those in the computer displayed hypertext and traditional print text groups (p=.004). This indicated that those exposed to the traditional printed text scored higher than those in the computer displayed hypertext group. These findings were similar to the findings from the total group analysis.

Table 8

Summary of Post Hoc Tests in Response to Research Question #1(Participants Reporting Some or A Lot of Effort)

Groups	p
Computer-displayed hypertext and Traditional printed text	.003
Computer-displayed hypertext and Computer-displayed linear text	.594
Computer-displayed linear text and Traditional printed text	.063

Research Question 2

During short-term, self-directed study, is there a significant difference in short-term knowledge retention based on gender ? The associated null hypothesis is given below:

Ho2: There is no significant difference in test scores of students based on gender. A summary of means and standard deviations for each group is shown in Table 9.

Table 9

Descriptive Statistics for Females and Males (All Participants)

Group	*n*	*M*	*SD*
Females	136	18.47	2.573
Males	131	17.47	3.026

The main effect ANOVA for gender was statistically significant (F=5.400, df=2,261, p=.021). The null hypothesis was rejected. Because only two groups were involved, no follow-up post hoc tests were necessary. This indicated that females scored higher than the males on the knowledge test.

The study also examined the effect that participants' effort level on the test had on the significance of the interactions between the groups. The participants' results were filtered to remove the results of participants who reported little or no effort on the study. Table 10 shows the summary for the groups after those records were removed.

Table 10

Descriptive Statistics for Females and Males (Participants Reporting Some or A Lot of Effort)

Group	*n*	*M*	*SD*
Females	127	18.66	2.331
Males	113	17.66	2.830

The main effect ANOVA for gender was statistically significant (F=5.732, df=2,234, p=.018). The null hypothesis was rejected. Because there were only two groups, follow-up post hoc tests were not necessary. This indicated that females scored higher then the males.

Research Question 3

During short-term, self-directed study, is there a significant gender by text display method interaction in short-term knowledge retention ? The associated null hypothesis is given below:

> Ho3: There is no significant difference in test scores of students based on a gender by text display method interaction.

A summary of means and standard deviations for each gender by text display method group is shown in Table 11.

Table 11

Descriptive Statistics for Each of the Gender by Text Display Method Groups (All Participants)

Group	Gender	*n*	*M*	*SD*
Computer-displayed linear text	Female	42	18.81	2.133
	Male	44	17.30	3.122
Computer-displayed hypertext	Female	40	17.40	3.020
	Male	57	17.14	3.062
Traditional printed text	Female	54	19.00	2.323
	Male	30	18.37	2.723

The gender by text display method was not statistically significant (F=1.205, df=2,261, p=.301). The null hypothesis was retained. No follow-up post hoc tests were necessary. This

indicated that there was no difference across the gender by text display method groups. The pattern of female and male difference was consistent across all three methods of text display.

The study also examined the effect that participants' effort level on the test had on the significance of the interactions between the groups. The participants' results were filtered to remove the results of participants who reported little or no effort on the study. Table 12 shows the summary for the groups after those records were removed.

Table 12

Descriptive Statistics for Each of the Gender by Text Display Method Groups (Participants Reporting Some or A Lot of Effort)

Group	Gender	*n*	*M*	*SD*
Computer-displayed linear text	Female	40	18.80	2.174
	Male	39	17.23	3.133
Computer-displayed hypertext	Female	36	17.78	2.474
	Male	48	17.50	2.674
Traditional printed text	Female	51	19.18	2.206
	Male	26	18.62	2.499

The gender by text display method was not statistically significant (F=1.419, df=2,234, p=.224). The null hypothesis was retained. No follow-up post hoc tests were necessary. This indicated that there was no difference across the gender by text display method groups. The pattern of female and male difference was consistent across all three methods of text display.

Research Question 4

Are there differences in item difficulties between students randomly assigned to different text display methods (printed text, computer-based linear text, and hypertext). The associated null hypothesis is given below:

> Ho4: There is no significant difference in the difficulty of test items between those assigned to different text display methods (printed text, computer-based linear text and hypertext). This more general hypothesis represents 25 different hypothesis tests, one for each specific item on the 25 item test.

The Chi-Square Test of Independence was used to determine if the percentage of correct responses differed across the three text display method groups. The results are shown in Table 13.

Table 13

Comparison of Item Difficulties Across the Three Text Display Groups

Question Number	Computer-displayed Linear Text Group	Computer-displayed Hypertext Group	Traditional Printed Text Group	X^2	p
1	.77	.77	.81	.525	.769
2	.49	.52	.56	.878	.645
3	.92	1.0	.96	8.338	**.015**
4	.95	.89	.96	5.203	.074
5	.86	.74	.90	9.244	**.010**
6	.19	.15	.18	.349	.840
7	.88	.89	.95	3.062	.216
8	.65	.61	.62	.380	.827
9	.73	.69	.85	6.055	**.048**
10	.88	.77	.81	3.872	.144
11	.90	.89	.90	.158	.924
12	.74	.64	.69	2.347	.309
13	.94	.89	.95	3.326	.190
14	.67	.65	.64	.211	.900
15	.80	.73	.80	1.647	.439
16	.94	.95	.98	1.321	.516
17	.52	.56	.60	.894	.640
18	.41	.31	.40	2.471	.291
19	.77	.79	.94	10.620	**.005**
20	.73	.67	.71	.914	.633
21	.41	.32	.50	6.086	**.048**
22	.97	.93	.95	1.332	.514
23	.94	.89	.98	5.921	.052
24	.78	.82	.92	6.182	**.045**
25	.19	.19	.20	.103	.950

The null hypothesis was rejected for questions 3, 5, 9, 19, 21, and 24. In all of those comparisons, except question 3, the difficulty score (which means the percentage getting the item correct) was higher in the traditional printed text group.

Summary

These analyses revealed significant differences in test scores across the three text delivery methods, with those students exposed to traditional printed text scoring higher than those exposed to computer-displayed hypertext. There were systematic differences in scores between females and males; females scored higher on the knowledge test. There was no gender by text display method interaction. Several of the items on the test appeared to be significantly easier for those in the traditional printed text group.

This chapter included an analysis of data for the four research questions. Chapter 5 includes a summary of findings, conclusions, and recommendations for further consideration.

CHAPTER 5

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine if there was a significant difference in short-term knowledge retention among first semester, traditional-aged college freshmen who used different text display methods (hypertext, computer-based linear text, and traditional printed text) in self-directed study. A secondary purpose was to determine if there were gender differences in short-term knowledge retention and whether there was a gender by text display method interaction. The population for the study consisted of all incoming freshmen at a regional public Southern university. The participants were 267 randomly selected freshmen. The participants were randomly assigned to three groups, one group for each of the text display methods. The participants were then asked to read a section of text and take a test on that material.

The findings of the study were analyzed using the Statistical Package for the Social Sciences (SPSS) software program version 11.0 for the Windows operating system. Analysis of variance (ANOVA) was the method used to examine the relationship between the dependant variable, in the form of test scores and the independent variables of display methods and gender.

Findings

With 267 subjects, out of 300 originally selected, taking part in the study, a participation rate of 89% was excellent.

Research Question 1. During short-term, self-directed study, is there a significant difference in short- term knowledge retention based on the text display method (printed text, computer-based linear text, and hypertext)

These results indicate that there was a significant difference in the short-term knowledge retention. Students who were presented the textual information in a traditional printed text format performed higher on the knowledge test than the students in the group who were presented computer-based hypertext. This finding was the same after removing participants who self-reported offering little or no effort in the study.

Research Question 2: During short-term, self-directed study, is there a significant difference in short-term knowledge retention, based on gender ?

There were clear gender-based differences in test score performance in this study. Females scored higher than males on the knowledge test.

Research Question 3: During short-term, self-directed study, is there a significant gender by text display method interaction in short-term knowledge retention ?

There were no gender by text display method interactions in test score performance. Females and males scored similarly on the knowledge test, and the pattern of difference was similar across all three of the test display methods.

Research Question 4: Are there differences in item difficulties between students randomly assigned to different text display methods (printed text, computer-based linear text, and hypertext) ?

There were six items on the test in which the item difficulty was different from one group to the next. In five of these instances, the items were significantly easier among the group exposed to traditional printed text.

Conclusions

As we look at the change in text display methods used in education, we must continue to keep in mind their effect on learning. It appears, from this study, that printed text is better for short-term retention of knowledge during self-directed study than computer displayed hypertext. Computer displayed linear text, however, shows no significant difference in short-term retention of knowledge over traditional printed text or computer displayed hypertext. Females scored higher on the knowledge test. There was, however, no gender by text display method interaction. This indicates that the differences between genders is consistent across levels of text display method.

Recommendations

1. Further studies are warranted that involve the same treatments as those used in this study, with text from different disciplines. This would allow these findings to be tested in different disciplinary content areas.
2. Additional research might involve the same treatments and include subjects from different educational levels. This could be conducted to see if the results from this study would be relevant to other educational levels.
3. Additional questions that examine additional levels of learning could provide information on the effects of text display methods on higher levels of learning.

4. The exploration of multiple reading rates could present a potential variance on this research and should be explored in future studies.
5. Further studies are warranted that explore how test display method interacts with text display method.
6. The exploration of alternative methods of displaying computer text such as adobe's PDF format and ebooks could also be explored.

Recommendations for Practice

Although the results of this study show that traditional printed text is statistically better for short term memory in self directed study over hypertext, the differences are not great enough to warrant recommendations for changes in practice.

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APPENDICES

APPENDIX A

Study Text

Stress, Health, and wellness

Louisa Denby's day began badly. She slept through her alarm and had to skip breakfast to catch the bus to campus. Then, when she went to the library to catch up on the reading she had to do before taking a test the next day, the one article she needed was missing. The librarian told her that replacing it would take 24 hours. Feeling frustrated, she walked to the computer lab to print out the paper she had completed at home the night before. The computer wouldn't read her disk. She searched for someone to help her, but she was unable to find anyone who knew any more about computers than she did. It was only 9:42 A. M., and Louisa had a wracking headache. Apart from that pain, she was conscious of only one feeling: stress.

Looking Ahead
Have you had a day like Louisa's?

Are most of your days like hers? Then you're no stranger to stress. It's something that all college students experience to varying degrees throughout their college careers. In fact, almost a third of first-year college students report feeling frequently overwhelmed with all they need to do.

Coping with stress is one of the challenges that college students face. The many demands on your time can make you feel that you'll never finish what needs to get done. This pressure produces wear-and-tear on your body and mind, and it's easy to fall prey to ill health as a result.

However, stress and poor health are not inevitable outcomes of college. In fact, by following simple guidelines and deciding to make health a conscious priority, you can maintain good physical and mental health.

This chapter covers the ways you can keep fit and healthy during—and beyond—college. It offers suggestions on how you can cope with stress, improve your diet, get enough exercise, and sleep better. It also will help you consider particular threats to mental and physical health that you're likely to face while you are in college, including alcohol and drugs, pregnancy, sexually transmitted diseases, and rape.

In sum, after reading this chapter you'll be able to answer these questions:

- What is stress and how can I control it?
- What is involved in keeping fit and healthy, and why is it important for me to do so?
- What are the main threats to my health and well-being?
- What are the components of sexual health?

Living with Stress

Stressed out? Tests, papers, reading assignments, job demands, roommate problems, volunteer activities, committee work. ... It's no surprise that these can produce stress. But it may be a surprise to know that so can graduating from high school, starting your dream job, falling in love, getting married, and even winning the lottery.

Virtually anything—good or bad—is capable of producing stress if it presents us with a challenge. Stress is the physical and emotional response we have to events that threaten or challenge us. It is rooted in the primitive "fight or flight" response wired into all animals—human and nonhuman. You see it in cats, for instance, when confronted by a dog or other threat: Their backs go up, their hair stands on end, their eyes widen, and, ultimately, they either take off or attack. The challenge stimulating this revved-up response is called a stressor. For humans, stressors can range from a first date to losing our chemistry notes to facing a flash flood.

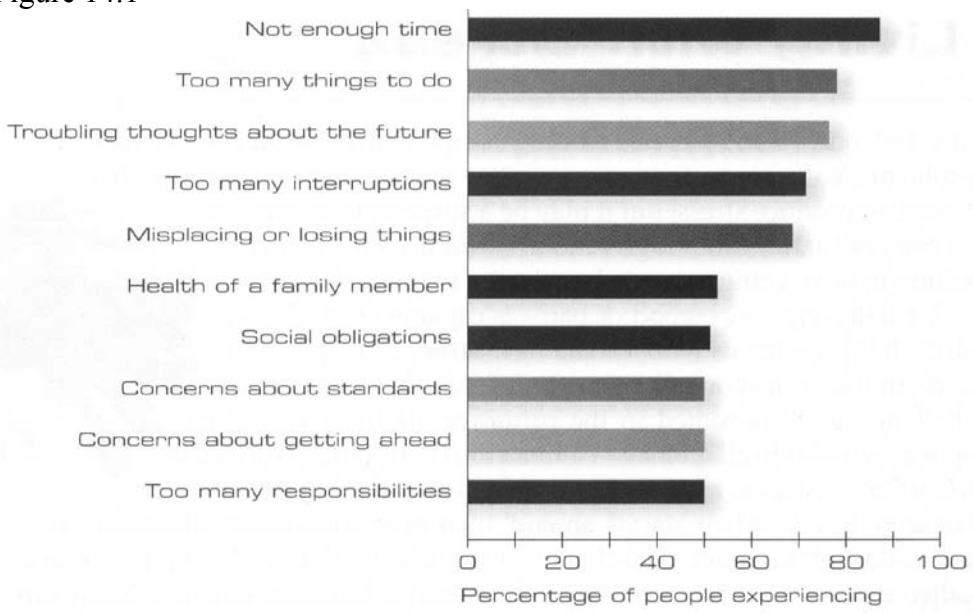
Because our everyday lives are filled with events that can be interpreted as threatening or challenging, stress is commonplace in most people's lives. There are three main types of stressors:

1. Cataclysmic events are events that occur suddenly and affect many people simultaneously. Tornadoes, hurricanes, and plane crashes are examples of cataclysmic events. Although they may produce powerful immediate consequences, ironically they produce less stress than other types of stressors. The reason? Cataclysmic events have a clear endpoint, which can make them more manageable. Furthermore, because they affect many people simultaneously, their consequences are shared with others, and no individual feels singled out.

2. Personal stressors are major life events that produce a negative physical and psychological reaction. Failing a course, losing a job, and ending a relationship are all examples of personal stressors. Sometimes positive events—such as getting married or starting a new job—can act as personal stressors. Although the short-term impact of a personal stressor can be difficult, the long-term consequences may decline as people learn to adapt to the situation.

3. Daily hassles are the minor irritants of life that, singly, produce relatively little stress. Waiting in a traffic jam, receiving a tuition bill riddled with mistakes, and being interrupted by noises of major construction while trying to study are examples of such minor irritants. However, daily hassles add up, and cumulatively they can produce even more stress than a single larger-scale event. (Figure 14.1 indicates the most common daily hassles in people's lives.)

Figure 14.1



Stress = The response to events that threaten or challenge us.

Cataclysmic events = Sudden, powerful events that occur quickly and affect many people simultaneously.

Personal stressors = Major life events the produce stress.

Daily hassles = The minor irritants of life that, by themselves, produce little stress, but which can add up and produce more stress than a single larger-scale event

What Is Happening When We Are Stressed Out

Stress does more than make us feel anxious, upset, and fearful. Beneath those responses, we are experiencing many different physical reactions, each placing a high demand on our body's resources. Our hearts beat faster, our breathing becomes more rapid and shallow, and we produce more sweat. Our internal organs churn out a variety of hormones. In the long run, these physical responses wear down our immune system, our body's defense against disease. We become more susceptible to a variety of diseases, ranging from the common cold and headaches to strokes and heart disease. In fact, surveys have found that the greater the number of stressful events a person experiences over the course of a year, the more likely it is that he or she will have a major illness.

Handling Stress

Coping = The effort to control, reduce, or learn to tolerate the threats that lead to stress.

Stress is an inevitable part of life. In fact, a life with no stress at all would be so boring, so uneventful, that you'd quickly miss the stress that had been removed.

That doesn't mean, though, that we have to sit back and accept stress when it does arise. Coping is the effort to control, reduce, or tolerate the threats that lead to stress. Using the P.O.W.E.R. principles can help you ward off stress and actively deal with it.

Prepare: Readying Yourself Physically

Being in good physical condition is the primary way to prepare for future stress. Stress takes its toll on your body, so it makes sense that the stronger and fitter you are, the less negative impact stress will have on you. For example, a regular exercise program reduces heart rate, respiration rate, and blood pressure at times when the body is at rest—making us better able to withstand the negative consequences of stress. Furthermore, vigorous exercise produces endorphins, natural painkilling chemicals in the brain. Endorphins produce feelings of happiness—even euphoria—and may be responsible for the "runner's high," the positive feelings often reported by long-distance runners following long runs. Through the production of endorphins, then, exercise can help our bodies produce a natural coping response to stress.

If you now drink a lot of coffee or soda, a change in your diet may be enough to bring about a reduction in stress. Coffee, soda, chocolate, and a surprising number of other foods contain caffeine, which can make you feel jittery and anxious even without stress; add a stressor, and the reaction can be very intense and unpleasant.

Eating right can alleviate another problem: obesity. Around one-third of people in the United States are obese, defined as having body weight more than 20 percent above the average weight for a person of a given height. Obesity can bring on stress for several reasons. For one thing, being overweight drags down the functioning of the body, leading to fatigue and a reduced ability to bounce back when we encounter challenges to our well-being. In addition, feeling heavy in a society that acclaims the virtues of slimness can be stressful in and of itself.

Organize: Identifying What Is Causing You Stress

You can't cope effectively with stress until you know what's causing it. In some cases, it's obvious—a series of bad test grades in a course, a roommate problem that keeps getting worse, a job supervisor who seems to delight in making things difficult. In other cases, however, the causes of stress may be more subtle. Perhaps your relationship with your boyfriend or girlfriend is rocky, and you have a nagging feeling that something is wrong.

Whatever the source of stress, you can't deal with it unless you know what it is. To organize your assault on stress, then, take a piece of paper and list the major circumstances that are causing you stress. Just listing them will help put you in control, and you'll be better able to figure out strategies for coping with them.

Work: Developing Effective Coping Strategies

A wide variety of tactics can help you deal with stress. Among the most effective approaches to coping are these:

Take charge of the situation. Stress is most apt to arise when we are faced with situations over which we have little or no control. If you take charge of the situation, you'll reduce the experience of stress. For example, if several assignments are all due on the same day, you might try negotiating with one of your instructors for a later due date.

Don't waste energy trying to change the unchangeable. There are some situations that you simply can't control. You can't change the fact that you have come down with a case of mono, and you can't change your performance on a test you took last week. Don't hit your head against a brick wall and try to modify things that can't be changed. Use your energy to improve the situation, not to rewrite history.

Look for the silver lining. Stress arises when we perceive a situation as threatening. If we can change how we perceive that situation, we can change our reactions to it. For instance, if your computer science instructor requires you to learn a difficult spreadsheet program in a very short time, the saving grace is that you may be able to use the skill to your advantage in getting a high-paying temporary job during school vacation.

"A smooth sea never made a skillful mariner." English proverb.

Social support = Assistance and comfort supplied by others in times of stress.

Talk to your friends. Social support, assistance and comfort supplied by others, can help us through stressful periods. Turning to our friends and family and simply talking about the stress we're under can help us tolerate it more effectively. Even anonymous telephone hotlines can provide us with social support. (The U.S. Public Health Service maintains a master toll-free number that can provide telephone numbers and addresses of many national helplines and support groups. You can reach it by calling 800-336-4794.)

Relax. Because stress produces constant wear and tear on the body, it seems possible that practices that lead to the relaxation of the body might lead to a reduction in stress. And that's just what happens. Using any one of several techniques for producing physical relaxation can prevent stress. Among the best relaxation techniques:

Meditation. Though often associated with its roots in the ancient Eastern religion of Zen Buddhism, meditation, a technique for refocusing attention and producing bodily relaxation, is practiced in some form by members of virtually every major religion. Meditation reduces blood pressure, slows respiration, and in general reduces bodily tension.

How do you meditate? The process is actually rather simple. It includes sitting in a quiet room with eyes closed or focused on a point about 6 feet away from you and paying attention to your breathing. Though the specifics of what you do may vary, meditation works by helping you

concentrate on breathing deeply and rhythmically, sometimes murmuring a word or sound repeatedly.

Progressive relaxation. Progressive relaxation does some of the same things that meditation does, but in a more direct way. To use progressive relaxation, you systematically tense and then relax different groups of muscles. For example, you might start with your lower arm, tensing it for 5 seconds and then relaxing it for a similar amount of time. By doing the same thing throughout the parts of your body, you'll be able to learn the "feel" of bodily relaxation. You can use the technique when you feel that stress is getting the better of you.

Remember that wimping out doesn't work—so keep your commitments.
Suppose you've promised a friend that you'll help him move, and you've promised yourself that you'll spend more time with your children. You've also been elected to the student body governing board, and you've made a commitment to bring more speakers to campus. Now you are facing all the demands connected to these commitments and feeling stressed.

You may be tempted to cope with the feeling by breaking some or all of your commitments, thinking, "I just need to sit at home and relax in front of the television!" This is not coping. It is escaping, and it doesn't reduce stress. Ducking out of commitments, whether to yourself or to others, will make you feel guilty and anxious, and will be another source of stress—one without the satisfaction of having accomplished what you set out to do. Keep your promises.

Evaluate: Asking If Your Strategies for dealing with Stress Are Effective

Just as the experience of stress depends on how we interpret circumstances, the strategies for dealing with stress also vary in effectiveness depending on who we are. So if your efforts at coping aren't working, it's time to reconsider your approach. If talking to friends hasn't helped ease your stress response, maybe you need a different approach. Maybe you need to see the silver lining or cut back on some of your commitments.

If one coping strategy doesn't work for you, try another. What's critical is that you not become paralyzed, unable to deal with a situation. Instead, try something different until you find the right combination of strategies to improve the situation.

Rethink: Placing Stress in Perspective

It's easy to think of stress as an enemy. In fact, the coping steps outlined in the P.O.W.E.R. Plan are geared to overcoming its negative consequences. But consider the following two principles, which in the end may help you more than any others in dealing with stress:

Don't sweat the small stuff.., and it's all small stuff. Stress expert Richard Carlson emphasizes the importance of putting the circumstances we encounter into the proper perspective. He argues that we frequently let ourselves get upset about situations that are actually minor. So what if someone cuts us off in traffic, or does less than his or her share on a group project, or unfairly criticizes us? It's hardly the end of the world, and the behavior of the other people involved in

such situations reflects negatively on them, not us. One of the best ways to reduce stress, consequently, is to maintain an appropriate perspective on the events of your life.

Make peace with stress. Think of what it would be like to have no stress—none at all—in your life. Would you really be happier, better adjusted, and more successful? The answer is "probably not." A life that presented no challenges would probably be, in a word, boring. So think about stress as an exciting, although admittedly sometimes difficult, friend. Welcome it, because its presence indicates that your life is stimulating, challenging, and exciting—and who would want it any other way?

Keeping Well

Eat right. Exercise. Get plenty of sleep.

Pretty simple, isn't it? We learn the fundamentals of fitness and health in the first years of elementary school.

Yet for millions of us, wellness is an elusive goal. We eat on the fly, stopping for a bite at the drive-in window of a fast-food restaurant. Most of us don't exercise enough, either because we feel we don't have enough time or because it's not much fun for us. And as for sleep, we're a nation in which getting by with as little sleep as possible is seen as a badge of honor.

"The first wealth is health." Ralph Waldo Emerson

You can buck the trends, however; you can begin to eat more properly, exercise effectively, and sleep better by following several basic rules. They include the following:

Eating Right

Eat a variety of "whole" foods, including fruits, vegetables, and grain products. Strive to eat a range of different foods. If you make variety your goal, you will end up eating the right foods. Also, the less processed the foods are, the better. Make an effort to choose "whole" foods, or foods in a state as close as possible to their natural state: brown rice is better than white rice, and both are better than a preservative-filled-packaged "rice casserole" mix.

Avoid foods that are high in sugar and salt content. Read labels on product packages carefully and beware of hidden sugars and salts. Many ingredients that end in -ose (such as dextrose, sucrose, maltose, and fructose) are actually sugars; salt can lurk within any number of compounds beginning with the word sodium.

Seek a diet low in fat and cholesterol. The fat that is to be especially avoided is saturated fat—the most difficult for your body to rid itself of.

Remember: Less is more. You don't need to walk away stuffed from every meal. Moderation is the key. To be sure you don't eat more than your body is telling you to eat, pay attention to internal hunger cues.

Schedule three regular meals a day. Eating should be a priority—a definite part of your daily schedule. Avoid skipping any meals. Breakfast is particularly important; get up early enough to eat a full meal.

Be sensitive to the hidden contents of various foods. Soda and chocolate can contain substantial quantities of caffeine, which can disrupt your sleep and, along with coffee, become addictive. Many cereals—even those labeled "low fat"—contain a considerable amount of sugar or salt. Pay attention to labels.

Beware of eating disorders. Between 1 and 4 percent of college-age women, and a smaller percentage of men, suffer from an eating disorder. Those with anorexia nervosa may refuse to eat, while denying that there is anything unusual in their behavior and appearance—which can become skeletal. Some 15 to 20 percent of those with anorexia literally starve themselves to death. Bulimia is a disorder in which individuals binge on incredibly large quantities of food, such as a gallon of ice cream and a whole pie, but later feel so much guilt and depression that they induce vomiting or take laxatives to rid themselves of the food. Eating disorders represent serious threats to health and require aggressive medical intervention.

Making Exercise a Part of Your Life

Exercise produces a variety of benefits. Your body will run more efficiently, you'll have more energy, your heart and circulatory system will run more smoothly, and you'll be able to bounce back from stress and illness more quickly.

Choose a type of exercise that you like. Exercising will be a chore you end up avoiding if you don't enjoy what you're doing.

Incorporate exercise into your life. Take the stairs instead of elevators. Leave your car at home and walk to campus or work. When you're on campus, take the longer way to reach your destination.

Make exercise a group activity. Exercising with others brings you social support and turns exercise into a social activity. You'll be more likely to stick to a program if you have a regular "exercise date" with a friend.

Vary your routine. You don't need to do the same kind of exercise day after day. Choose different sorts of activities that will involve different parts of your body and keep you from getting bored.

One note of caution: Before you begin an exercise program, it is a good idea to have a physical checkup, even if you feel you're in the peak of health. This is especially true if you're starting an

exercise program after years of inactivity. You also might consult a trainer at the gym to set up a program that gradually builds you up to more vigorous exercise.

Getting a Good Night's Sleep

Do you feel as if you don't get enough sleep? You probably don't. Most college students are sleep-deprived, a condition that causes them to feel fatigued, short-tempered, and tense. Insufficient sleep also leads to declines in academic and physical performance. You can't do your best at anything if you're exhausted—or even tired.

Often the solution to the problem is simply to allow yourself more time to sleep. Most people need around 8 hours of sleep each night, although there are wide individual differences. In addition to sleeping more, there are also some relatively simple changes you can make in your behavior that will help you to sleep better. They include the following:

Exercise more. Regular exercise will help you sleep more soundly at night, as well as help you cope with stress that might otherwise keep you awake.

Have a regular bedtime. By going to bed at pretty much the same time each night, you give your body a regular rhythm and make sleep a habit. Use your bed for sleeping and not as an all-purpose area. Don't use your bed as a place to study, read, eat, or watch TV. Let your bed be a trigger for sleep.

Avoid caffeine after lunch. The stimulant effects of caffeine (found in coffee, tea, and some soft drinks) may last as long as 8 to 12 hours after it's consumed.

Drink a glass of milk at bedtime. Your mom was right: Drinking a glass of milk before you go to bed will help you get to sleep. The reason: Milk contains a natural chemical that makes you drowsy.

Avoid sleeping pills. Steer clear of sleeping pills. Although they may be temporarily effective, in the long run they impair your ability to sleep because they disrupt your natural sleep cycles.

Don't try to force sleep on yourself. Although this advice sounds odd, it turns out that one of the reasons that we have trouble sleeping is that we try too hard. Consequently, when you go to bed, just relax, and don't even attempt to go to sleep. If you're awake after 10 minutes or so, get up and do something else. Only go back to bed when you feel tired. Do this as often as necessary. If you follow this regimen for several weeks— and don't take naps or rest during the day—eventually getting into your bed will trigger sleep.

Drug Abuse

For better or worse, drugs are part of all of our lives. It's virtually impossible to be unaware of the extent of the U.S. and international problem of illegal drug use, which involves millions of individuals who have used illegal substances at least once. Patterns of drug use or avoidance are often established in college. These patterns can have a big impact on your college career and

your life, so it is a good idea to learn what you can now, before negative patterns of abuse, and in some cases, addiction, take hold.

Alcohol and Its Allure

The drug most likely to be found on college campuses is alcohol. It may surprise you to know that though it initially seems to raise your spirits, alcohol is actually a depressant. As the amount of alcohol one consumes increases, its depressive effects become more obvious. You've probably seen its other negative effects: Drinkers show their speech becomes slurred and eventually incoherent. If you drink enough, you'll pass out. And as some of the more dramatic cases in the news illustrate, if you consume enough alcohol in a short period, you can die. It's that simple.

The potential negative consequences of drinking have done little to prevent the use of alcohol on college campuses. More than 75 percent of college students say they've had a drink within the last 30 days, and the average person over the age of 14 drinks 21/2 gallons of pure alcohol over the course of a year—some 200 drinks, on average, per person.

Some students drink even more, and the extent of alcohol consumption can reach astonishing levels. Half of all male college students and 40 percent of all female college students have engaged in binge drinking, defined as having at least four (for females) or five (for males) drinks in a single sitting. Such heavy drinking doesn't just affect the drinker. Most college students report having had their studying or sleep disturbed by drunk students. Further, around a third of students have been insulted or humiliated by a drunk student, and 25 percent of women have been the target of an unwanted sexual advance by a drunk classmate.

Close to 20 million people in the United States are alcoholics, and college students make up their fair share of the total. Alcoholics, individuals with serious alcohol-abuse problems, become dependent on alcohol, experiencing a physical craving for it. They continue to drink despite serious consequences. Furthermore, they develop a tolerance for alcohol and must drink increasing amounts to experience the initially positive effects that alcohol brings about.

The long-term consequences of high levels of alcohol consumption are severe. Heavy drinking damages the liver and digestive system, and can even affect brain cells. In fact, virtually every part of the body is eventually affected by heavy alcohol use.

Nicotine

Despite the recent multi-billion-dollar tobacco settlements between all 50 state governments and the manufacturers of cigarettes, smoking remains a significant health problem. Smoking causes lung damage and increases the risks of developing cancer, emphysema, and a host of other diseases.

Why do people smoke, when the evidence is so clear about its risks? They start to smoke for a variety of reasons. Smoking is sometimes viewed as a kind of initiation into adulthood, a sign of growing up. In other cases, teenagers see smoking as "cool," a view promoted by movies and television.

"I set some limits for myself, and my transcript thanked me for it from then on."
Betty Baugh Harrison, University of North Carolina

The problem is that, no matter what reason persuades a person to try out a few cigarettes, smoking can quickly become a habit, because a major ingredient of tobacco—nicotine—is an addictive drug. An addictive drug produces a biological or psychological dependence. The absence of the drug leads to a craving for it that may be nearly irresistible.

Smoking is one of the hardest addictions to break. Among the suggestions for quitting are the following:

1. Remain smoke-free one day at a time. Don't think about not smoking tomorrow, or next week, or for the rest of your life. Instead, think of not smoking for the rest of the day. You can worry about tomorrow... tomorrow.
2. Visualize the consequences of smoking. Visualize blackened, rotting lungs filled with smoke. Then think about the fresh, pink lungs that you'll have after you've stopped smoking.
3. Exercise. The all-purpose antidote, exercise, will make you feel better physically and take your mind off smoking.
4. Use nicotine patches or nicotine gum. "Patch" and nicotine gum can provide enough nicotine to satisfy your craving for the drug, while permitting you to stop smoking. Physicians can also sometimes prescribe drugs that help reduce the craving for nicotine.
5. Avoid people when they're smoking. It's nearly impossible to avoid the urge to smoke when others are lighting up. If you're trying to quit, stay away from people who are smoking.
6. Enlist the social support of family and friends. Tell others that you're trying to quit, and accept their encouragement and praise.
7. Reward yourself. Every few days, give yourself some kind of reinforcement for spending a period of time smoke-free. Go to a movie; buy a CD. Think about how you can afford these more easily since you aren't buying cigarettes anymore.
8. Join a quit-smoking program. Many college health services hold periodic programs to help students who want to stop smoking. By enrolling in one, you'll receive the support of others who are in the same boat as you are.
9. Keep trying. If after quitting you start smoking again, just consider that lapse as part of the process of quitting. Many people quit several times before they manage to quit for good.

Illegal Drugs "Just say 'no.'"

If it were only so easy. Decisions about drugs are quite a bit more complicated than simplistic antidrug slogans would have you believe. Using or not using drugs involves, at a minimum, peer pressure, your values, and the effects they have on your body, your behavior, and your self-image.

Several things are clear, however. Despite the prevalence of illicit drug use among college students—surveys show that around a third of college students report having used an illegal drug at least once in the previous year—the benefits of drug use are difficult to enumerate. Apart from a temporary high, the advantages of using drugs are nil, and the use of illegal drugs is among the riskiest activities in which people can engage. Not only does drug use make you vulnerable to arrest, but it also poses short- and long-term health risks. The escape from one's responsibilities that drugs provide is likely to make it even harder to later deal with those responsibilities—which aren't going to go away.

Not all illegal drugs are the same, and they produce widely varying effects and consequences (see Table 14.2). But they all share a common result: a reduction in awareness of and engagement with what is happening around you.

People often fall into drug use without much thought. But doing so is still a choice. Preaching and slogans are not going to help you to make a sensible decision. You need to employ every critical thinking skill you can to determine exactly what you wish—and don't wish—to introduce into your body. Give some thought to why escape is attractive and consider seeking counseling instead. Allow yourself to consider the long- and short-term effects of drug use—both the physical effects as well as the potential effects on your own aspirations and dreams. Think about the legal consequences of drug use: A drug conviction can lead to expulsion from college and refusal by many employers to hire you. Furthermore, random drug tests are increasingly a part of corporate life, and your ability to keep a job may be placed at risk if you use drugs—even only occasionally.

Table 14.2 Illegal Drugs

Stimulants

Drug: Cocaine

Street Name: Coke, blow, snow, lady, crack

Drug: Amphetamines, Benzedrine, Dexedrine

Street Name: Speed

Effects: Increased confidence, mood elevation, sense of energy and alertness, decreased appetite, anxiety, irritability, insomnia, transient drowsiness, delayed orgasm

Withdrawal Symptoms: Apathy, general fatigue, prolonged sleep, depression, disorientation, suicidal thoughts, agitated motor activity, irritability, bizarre dreams

Depressants

Drug: Alcohol

Street Name: Booze

Drug: Barbituates, Nembutal

Street Name: Yellowjackets, yellows

Drug: Seconal

Street Name: Reds

Drug: Phenobarbital

Effects: Anxiety reduction, impulsiveness, dramatic mood swings, bizarre thoughts, suicidal behavior, slurred speech, disorientation, slowed mental and physical functioning, limited attention span

Withdrawal Symptoms: Weakness, restlessness, nausea and vomiting, headaches, nightmares, irritability, depression, acute anxiety, hallucinations, seizures, possible death

Drug: Rohypnol

Street Name: Roofies, rope, "date-rape drug"

Effects: Muscle relaxation, amnesia, sleep

Withdrawal Symptoms: Seizures

Narcotics

Drug: Heroin

Street Name: H, hombre, junk, smack, dope, crap, horse

Drug: Morphine

Street Name: Drugstore dope, cube, first line, mud

Effects: Anxiety and pain reduction, apathy, difficulty in concentration, slowed speech, decreased physical activity, drooling, itching, euphoria, nausea

Withdrawal Symptoms: Anxiety, vomiting, sneezing, diarrhea, lower back pain, watery eyes, runny nose, yawning, irritability, tremors, panic, chills and sweating, cramps

Hallucinogens

Drug: Cannabis, Marijuana, Hashish, Hash oil

Street Name: Bhang, kif, ganja, dope, grass, pot, smoke, hemp, joint, weed, bone, Mary Jane, herb, tea

Effects: Euphoria, relaxed inhibitions, increased appetite, disoriented behavior

Withdrawal Symptoms: Hyperactivity, insomnia, decreased appetite, anxiety

Drug: MDMA

Street Name: Ecstasy

Effects: Heightened sense of oneself and insight, feelings of peace, empathy, energy

Withdrawal Symptoms: Not reported

Drug: LSD

Street Name: Acid, quasey, microdot, white lightning

Effects: Heightened aesthetic responses; vision and depth distortion; heightened sensitivity to faces and gestures; magnified feelings; paranoia; panic; euphoria

Withdrawal Symptoms: Not reported

Drugs that produce addiction, such as cocaine and heroin, present a further set of problems. The lives of people with drug addictions become centered on the drug. They enter into a pattern of alternating highs—when on the drug—and lows. During their lows, much of their thinking is centered on obtaining the drug and looking forward to their next high.

Addiction's Warning Signs

Addictions to drugs—including alcohol—can begin subtly, and you may not be aware of the extent of the problem. Here are some signs that indicate when use becomes abuse:

- Feeling you need to be high to have a good time.
- Being high more often than not.

- Getting high to "get yourself going."
- Going to class or work high.
- Missing class or work because you are high.
- Being unprepared for class because you were high.
- Feeling regret over something you did while you were high.
- Driving while high.
- Having a legal problem due to being high.
- Behaving, while high, in a way you wouldn't otherwise.
- Being high in nonsocial, solitary situations.
- Thinking about drugs or alcohol much of the time.
- Avoiding family or friends while using liquor or drugs.
- Hiding drug or alcohol use from others.

Any one of these symptoms indicates that you have a drug or alcohol problem. If you do have a problem, seek professional help. Addictions to illegal drugs or alcohol are extremely difficult to deal with on your own. No matter how good your intentions, almost no one can overcome the cravings brought about by an addiction to a particular substance without help.

Here are some places to which you can turn:

1. **College health services, counseling centers, and mental health centers.** Most colleges provide services to help you overcome an addiction. They can evaluate the extent of the problem and refer you to the proper place for further help.

2. **Drug treatment centers and clinics.** Sometimes located in hospitals and sometimes independently run, drug treatment centers or clinics can provide help. You can also check your telephone book for a local listing of Alcoholics Anonymous or Narcotics Anonymous.

3. **Government hotlines. The** federal government provides extensive information about drug and alcohol use. For starters, call The National Clearinghouse on Alcohol and Drug Information at 1-800-729-6686. For alcohol difficulties in particular, call the National Council on Alcoholism at (800) 622-2255. For drug problems, you can call the National Institute on Drug Abuse at (800) 662-4357. Finally, you can write to the National Council on Alcoholism and Drug Dependence, 12 West 21 Street, New York, NY 10010, for help with alcohol and drug problems.

Sexual Health and Decision Making

Relationships. Contraception. AIDS. Rape.

Sexual health includes a host of issues, involving not just your body but your heart and mind as well. In fact, it is often said that our most important sexual organ is our brain. It determines what

we view as sexually arousing, and it's what we use to make decisions and choices about our sexuality.

Although the focus of the brief discussion of sexual health here is on strategies for protecting yourself (from pregnancy, sexually transmitted diseases, and rape), sexual decisions are also a reflection of your basic values. You can't make responsible decisions about sex without knowing what is important to you and how you view yourself. So you don't want to wait until a sexual encounter begins before thinking through your views of sexuality and what is and is not right for you.

Preventing Unwanted Pregnancy

Abstinence = The avoidance of sexual contact

There is one and only one totally effective means of preventing pregnancy:
Not having sexual intercourse. Abstinence, refraining from intercourse, only works, however, if you practice it with absolute consistency—something that many people find difficult. But it certainly is possible. Despite the folklore that insists "everybody's doing it," they're not. In fact, if you think critically about what others say about their sexual activity, you'll probably conclude that what they say is more boasting (and outright lying) than straight talk.

Those who do want to have a sexual relationship can still avoid pregnancy. Methods of contraception include the following:

Birth control pills. Composed of artificial hormones, birth control pills are among the most effective ways of preventing pregnancy—as long as they are taken as prescribed. Except for women with particular medical conditions, the side effects are minimal.

Implants. One of the newest forms of birth control, implants work through a simple surgical procedure in which a small capsule is inserted into a woman's arm. Implants last for 5 years, preventing pregnancy for the entire period. With few side effects, implants are highly effective, but they are only practical for women who wish to avoid pregnancy for extended periods.

Intrauterine device, or IUD. IUDs are small pieces of plastic inserted by a medical practitioner into a woman's uterus. Although highly effective, some have been found to produce unacceptable side effects, including infections and scarring that can make it impossible for a woman to get pregnant when she wants to.

Diaphragms and cervical caps. Diaphragms and cervical caps are circular, dome-shaped pieces of thin rubber that a woman inserts into her vagina to cover the cervix. A sperm-killing cream or jelly must be used simultaneously, and the diaphragm or cervical cap must be removed after sexual intercourse. Although side effects are few, the risk of pregnancy is somewhat higher than with the other forms of birth control we've discussed; some 18 percent of women using them become pregnant.

Condoms. Condoms are thin sheaths that fit over the penis. By preventing sperm from entering the vagina, they are highly effective in preventing pregnancy when used properly and consistently. When used with a contraceptive jelly that kills sperm and positioned properly, condoms are highly effective.

Contraceptive sponge. The sponge, shaped like a large mushroom cap, is inserted into the vagina. It can be left in place for 24 hours, during which time it can be used for multiple acts of intercourse. Although it has few side effects, it has a failure rate of between 17 and 25 percent.

Periodic abstinence. The only form of birth control that involves no chemical or mechanical intervention, periodic abstinence consists of refraining from intercourse during times in a woman's menstrual cycle when pregnancy is possible. With a failure rate of 20 percent, periodic abstinence requires close scrutiny of calendars, body temperature, and cervical mucus—all of which can be indicators of the time of the month to avoid intercourse.

Sterilization. Sterilization is a surgical procedure that causes a person (either a man or a woman) to become permanently incapable of having children.

Emergency contraception. Several forms of birth control can prevent pregnancy after unprotected intercourse. These involve using increased doses of certain oral contraceptive pills within 72 hours or insertion of a copper intrauterine device (IUD) within 5 to 7 days following unprotected sex.

Withdrawal and douching (ineffective birth control). Withdrawal, in which a man removes his penis from a woman's vagina before ejaculating, and douching, flushing the vagina with a liquid after the man has ejaculated, just don't work. They should not be used for birth control because they are so ineffective.

What You Can Do to Avoid Sexually Transmitted Diseases.

Right now, one out of five people in the United States is infected with one of the many types of sexually transmitted diseases (STDs)—medical conditions acquired through sexual contact. At least one out of four will eventually contract an STD at some point in life.

There are many varieties of STDs, although all share a similar origin: sexual contact. Depending on the type of disease, symptoms may include warts in the genital area, pelvic infection, painful urination, infertility, blindness, and even death.

The STD that has had the greatest impact in the last decade is acquired immune deficiency syndrome (AIDS). Although in the U.S. it initially most often affected homosexuals, AIDS quickly spread among heterosexuals. Some populations are particularly affected, such as intravenous drug users.

Acquired immune deficiency syndrome (AIDS) = A lethal, sexually transmitted disease that causes the destruction of the body's immune system

Sexually transmitted diseases (STDs) = Medical conditions acquired through sexual contact

Worldwide, more than 16 million people have already died from the disease. Some estimates suggest that 40 million people now carry the AIDS virus. Despite new treatments, AIDS remains incurable. In the U.S., AIDS is the leading cause of death among men 25 to 44 years of age and the third leading cause of death among women in that age range.

Although AIDS is the best-known STD, the most common is chlamydia, a disease that if left untreated can cause sterility in some sufferers. Genital herpes is a virus that appears as small blisters or sores around the genitals. Although the sores heal after several weeks, the disease can remain dormant and reappear periodically. Other STDs, although somewhat less common, afflict millions of people. (See Table 14.3 for a summary of the common STDs.)

The only completely effective way to avoid sexual transmission of these diseases is through abstinence. However, many people are unwilling to make such a choice. Several alternative approaches, called "smart sex" or "safe sex" practices, reduce the risk of contracting STDs. They include the following:

- **Know your sexual partner—well.** You should not have sexual contact with a person who is only a casual acquaintance. You want to know the person well enough to have a discussion with him or her in which you both talk about your sexual histories.
- **Prevent the exchange of bodily fluids during all sex acts.** Avoid unprotected intercourse (vaginal or anal) and oral sex.
- **Use condoms.** Condoms not only prevent the spread of AIDS and other STDs, but they also prevent pregnancy.
- **Be faithful to a single partner.** People in long-term relationships with only one other individual are less likely to contract AIDS and other STDs than those with multiple sexual partners.

Table 14.3 Common Sexually Transmitted Diseases (STDs)

AIDS-HIV

Cause: Human immunodeficiency virus (HIV)

Transmission: Coming in direct contact with infected blood, semen, or vaginal secretions.
Anal or vaginal intercourse, being born to an infected female, receiving infected blood or blood products, or sharing needles and syringes with someone infected with the HIV virus.

Symptoms: In early stages of infection with HIV there typically are no symptoms.
As the disease progresses the following are usual symptoms:

- Chronic or swollen glands.

- Weight loss of more than 10 pounds.
- Flu-like symptoms that persist.
- Purple spots on the skin and inside the mouth, nose, or rectum.
- Unusual susceptibility to parasitic, fungal, bacterial, and viral infections or certain cancers.

Chlamydia

Cause: Bacteria

Transmission: Vaginal or anal intercourse or oral sex with someone who is infected.

Symptoms: Many infected people have no symptoms, but when present the most common are the following: Pain, burning or "itching" sensations with urination. Vaginal infections may be associated with abnormal discharge. Oral infections may be exhibited by a sore throat but usually have no symptoms. Penile infections may be associated with a yellowish discharge.

Gonorrhea

Cause: Bacteria

Transmission: Vaginal or anal intercourse or oral sex with someone who is infected.

Symptoms: Many infected people have no symptoms but are still contagions. Most common symptoms are the following: Pain, burning or "itching" sensations with urination. Vaginal infections may be associated with abnormal discharge. Oral infections may be exhibited by a sore throat but usually have no symptoms. Penile infections may be associated with a yellowish discharge.

Hepatitis A

Cause: Virus

Transmission: Spread through contaminated feces and anal-oral contact during sexual activity.

Symptoms: Symptoms for Hepatitis A and B will be similar: nausea, vomiting, diarrhea, fatigue, lack of appetite, dark urine, light stools, and/or abdominal tenderness.

Hepatitis B

Cause: Virus

Transmission: Spread via blood by sexual contact or via an injection with a contaminated needle.

Symptoms: Symptoms for Hepatitis A and B will be similar: nausea, vomiting, diarrhea, fatigue, lack of appetite, dark urine, light stools, and/or abdominal tenderness.

Genital Herpes

Cause: Herpes simplex virus (HSV)

Transmission: Contact with virus in infected blisters or within virus being shed from the site of previous infections that may have no symptoms.

Symptoms: Cluster of tender, painful blisters, ulcers, or sores typically on or around the lips, mouth, genitals, or anus. Symptoms may be very mild or not present at all, but people are still infected and contagious. Blisters, ulcers, and sores last one to three weeks during initial outbreaks. Lesions heal, but person still has herpes. Lesions commonly recur without being re-exposed to the disease.

Genital Warts

Cause: Human papilloma virus (HPV)

Transmission: Vaginal or anal intercourse or oral sex with someone who has the virus.

Symptoms: Small bumpy "cauliflower" looking warts that are usually painless and appear on or around the genitals or anus. Itching and burning around the lesions may occur, but such symptoms are rare. Infections without symptoms are common.

Date Rape

We usually think of rape as a rare crime, committed by strangers. Unfortunately, rape is surprisingly common and rapists usually know their victims. In a national survey conducted on college campuses, one out of eight women reported having been raped. In about half the reported cases, the rapists were first dates, casual dates, or romantic acquaintances—situations categorized as date rape. Overall, women are far more likely to be raped by someone they know than by a stranger. There is a 14 to 25 percent chance that a woman will be the victim of rape during her lifetime. Although date rape is the more common type on campus, it is only different from any other form of rape in that the victim is acquainted with the rapist.

What leads to rape? Most often, rape has less to do with sex than with power and anger. Rapists use forced sex to demonstrate their power and control over the victim. The rapist's pleasure comes not so much from sex as from forcing someone to submit. Sometimes sexual behavior is a demonstration of the rapist's rage at women in general.

In addition, rapes sometimes are brought about by the common—but untrue—belief that when women offer resistance to sex, they don't really mean it. If a man holds the view that when a woman says no to sex, she really means yes, he is likely to ignore the woman's protests, and the

encounter may end in rape. Some men may even believe that it is unmasculine to accept no for an answer.

Some rapists employ the illegal drug rohypnol, which has come to be known as the "date rape drug." When it is mixed with alcohol, it can prevent victims from resisting sexual assault. Sometimes people who are unknowingly given the drug don't even remember the rape.

Whatever the causes, rape is devastating to the victim. Victims experience extreme anxiety, disbelief, fear, and shock. These reactions may linger for years, and rape victims may experience a long-lasting fear of entering into relationships.

Both men and women must be sensitive to the issue of date rape. Among the suggestions for reducing its incidence are the following:

- Set limits. Women have the right to set firm limits, and these should be communicated clearly, firmly, and early on.
- No means no. When a partner says no, it means no—nothing else.
- Be assertive. You should never passively accept being pressured into an activity in which you don't want to engage. Remember that passivity may be interpreted as consent.
- Communicate. Women and men should talk about their views of sexual behavior and what is and is not permissible.
- Keep in mind that alcohol and drugs cloud judgment. Nothing hinders communication more than alcohol and drugs.

Date rape = Forced sex in which the rapist is a date or romantic acquaintance

Looking Back

What is stress and how can I control it?
Stress is a common experience, appearing in three main forms: cataclysmic events, personal stressors, and daily hassles. Excessive stress is not only unpleasant and upsetting, but it also has negative effects on the body and mind.

Coping with stress involves becoming prepared for future stress through proper diet and exercise, identifying the causes of stress in one's life, taking control of stress, seeking social support, practicing relaxation techniques, training oneself to redefine and reinterpret stressful situations, and keeping one's promises.

What is involved in keeping fit and healthy, and why is it important for me to do so?
For all people, keeping fit and healthy is both essential and challenging. It is vital to learn to eat properly, especially by eating a variety of foods on a regular schedule and by restricting your intake of fat, cholesterol, and salt.

Exercise is valuable because it improves health and well-being. Choosing exercises that we like, making everyday activities a part of exercise, and exercising with others can help form the habit of exercise.
The third key element of good health is sleeping properly. Good exercise and eating habits can contribute to sound sleep, as can the development of regular sleeping habits and the use of sleep-assisting practices.

What are the main threats to my health and well-being?

One of the major threats that college students (and others) face is the improper use of drugs. The most commonly abused drug is alcohol, which is a depressant (despite an initial reduction of inhibitions and feeling of euphoria) and can lead to a physical or psychological dependence. Nicotine is the second most commonly abused drug.

The use of illegal drugs presents not only potential dangers related to law-breaking and prosecution, but short- and long-term health risks as well. Drugs cause a reduction in awareness and involvement in life, and some drugs can be dangerously addictive.

What are the components of sexual health?
Sexual health is as important as other forms of health. People must make their own individual decisions about their sexuality and how they will express it.

Many forms of contraception are available, ranging from abstinence to surgical implants. Each form has different procedures, risks, and effectiveness.

The incidence of sexually transmitted diseases (STDs) is high in the United States, with about 25 percent of the population experiencing an STD at some point in life.

Rape is a surprisingly common crime, with most victims knowing the rapist—often in a circumstance known as date rape.

APPENDIX B

Instrument

Directions
Read each question carefully and mark your answer on the Blue bubble sheet provided. Make no marks on the test booklet. Use a number two pencil (provided) and fill in each correct answer bubble completely. Be careful not to make any stray marks on the answer sheet. Fill in the gender section and questions 1 through 25. You will have 12 minutes to complete the test.

1. Coping with stress is an effort to do all but which of the following?
A. Control stress
B. Reduce stress
C. Learn to tolerate stress
D. Ignore stressors

2. What percentage of college-aged women suffer from an eating disorder?
A. 1 to 4
B. 5 to 8
C. 9 to 11
D. 12 to 15

3. What drug is most likely to be found on college campuses?
A. Marijuana
B. Alcohol
C. Cocaine
D. LSD

4. Which of the following are sudden, powerful events that occur quickly, have a clear end point, and affect many people simultaneously?
A. Personal stressors
B. Daily hassles
C. Social stressors
D. Cataclysmic events

5. Which of the following is not a suggested way to quit smoking?
A. Avoid being around people who are smoking
B. Enlist the social support of friends
C. Visualize the consequences of smoking
D. Set weeklong goals of no smoking

6. Which of the following is not a physical response to stress?
A. More shallow breathing
B. Increased production of hormones
C. Increased sweat
D. Increased anxiety

7. Most people need how many hours of sleep?
A. 9
B. 8
C. 7
D. 6

8. What percentage of college students reported that they have had a drink in the last 30 days?
A. 35
B. 55
C. 75
D. 85

9. On food labels, which of the following is a sugar?
A. Benzoate
B. Lecithin
C. Maltose
D. Saccharine

10. What is the name for minor life events that singly produce little stress, but can add up to greater stresses?
A. Personal stressors
B. Daily hassles
C. Cataclysmic events
D. Social stressors

11. Which drug is referred to as the date rape drug?
A. Rohypnol
B. Benzedrine
C. Nembutal
D. Hashish

12. Which of the following is the most common source of stress?
A. Social obligations
B. Too many responsibilities
C. Personal health
D. Not enough time

13. Which of the following is not suggested as an effective coping strategy for stress?
A. Talking to friends
B. Look for the good in situations
C. Taking charge of the situation
D. Know when to give up

14. What percentage of college students have reported using illegal drugs in the previous year?
A. 11
B. 33
C. 55
D. 77

15. Major life events that produce negative physical and psychological reactions are called what?
A. Cataclysmic events
B. Daily hassles
C. Personal stressors
D. Social stressors

16. Which of the following is not considered a good exercising tip?
A. Vary your routine
B. Choose a type of exercise that you enjoy
C. Incorporate exercise into your daily life
D. Exercise alone to avoid distractions

17. What percentage of male college students reported that they have engaged in binge drinking?
A. 20
B. 50
C. 70
D. 90

18. Which of the following drugs is not classified as a hallucinogen?
A. Cannabis
B. Heroin
C. MDMA
D. LSD

19. What is the failure rate of contraceptive sponges for birth control?
A. 17 to 25 percent
B. 26 to 33 percent
C. 34 to 41 percent
D. 42 to 50 percent

20. In the United States, AIDS is the leading cause of death among which of the following groups?
A. Women age 25 to 44
B. Women age 18 to 24
C. Men age 25 to 44
D. Men age 18 to 24

21. Which of the following is a withdrawal symptom of cocaine?
A. Suicidal thoughts
B. Seizures
C. Hyperactivity
D. Insomnia

22. Which of the following is not a good eating tip?
A. Eat full servings at each meal
B. Avoid foods that are high in salt and sugar
C. Seek a diet low in fat and cholesterol
D. Avoid skipping meals

23. Which of the following is not a healthy tip to help you sleep better?
A. Read in bed before going to sleep
B. Avoid sleeping pills
C. Have a regular bedtime
D. Drink a glass of milk at bedtime

24. Binge drinking is defined as having how many drinks per sitting?
A. 3 for females / 4 for males
B. 4 for females / 5 for males
C. 5 for females / 6 for males
D. Three drink for both males and females

25. Of rapes reported on college campuses, what percentage of rapists were first dates, casual dates, or romantic acquaintances?
A. 30
B. 50
C. 70
D. 80

APPENDIX C

Java code

```
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<head>
  <title>Entry Page</title>
</head>
<body>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
{
var address = "htmlpower/powertext.html";
var op_tool  = "no";
var op_loc_box  = "no";
var op_dir  = "no";
var op_stat  = "no";
var op_menu  = "no";
var op_scroll  = "yes";
var op_resize  = "no";
var op_wid  = "";
var op_heigh = "";
var option = "toolbar="+ op_tool +",location="+ op_loc_box +",directories="
+ op_dir +",status="+ op_stat +",menubar="+ op_menu +",scrollbars="
+ op_scroll +",resizable="  + op_resize +",width=" + op_wid +",height="+ op_heigh;
var win3 = window.open("", "what_I_want", option);
var win4 = window.open(address, "what_I_want");
}
function clear(form) {
document.form1.wid.value="";
document.form1.heigh.value="";
}
// End -->
</SCRIPT>
<BODY>
<CENTER>
<h4>Please click the START button below to go to the text.</h4>
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<FORM name=form1  ACTION="javascript:" METHOD="POST">
<BR><CENTER>
<INPUT TYPE="button" VALUE="START" OnClick="customize(this.form)"><BR>
</PRE></TD></TR></TABLE>
</FORM>
</CENTER>
</body>
</html>
```

VITA

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