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Speech recognition: The interpretation of training and using speech recognition software from the perspectives of postsecondary students with learning challenges

Delann Soenksen

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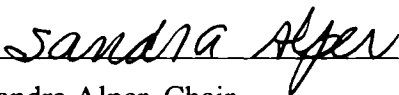
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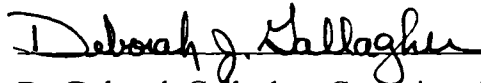
SPEECH RECOGNITION: THE INTERPRETATION OF TRAINING AND USING
SPEECH RECOGNITION SOFTWARE FROM THE PERSPECTIVES OF
POSTSECONDARY STUDENTS WITH LEARNING CHALLENGES

A Dissertation
Submitted
In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

Approved:



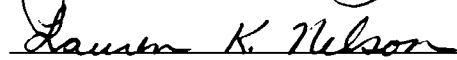
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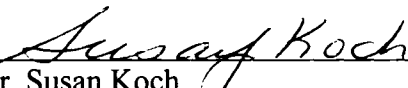
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Dr. Sandra Alper, Committee Chair



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ABSTRACT

This study examined the utilization of speech recognition programs by five college students with learning difficulties. A qualitative approach was implemented over the course of two semesters, Fall 2003 and Spring 2004, to: (a) ascertain students' perspectives on speech recognition, and (b) understand how students used speech recognition programs as a tool to meet the academic demands of postsecondary education. Data collection for this study included interviews, participant observations, field notes, videotape, and course assignments. This study provided qualitative data regarding an assistive technology tool that has traditionally been studied within a quantitative paradigm. Environment, individual characteristics, and life demands were found to impact student use of their speech recognition program. Implications for users, educational professionals, and researchers are presented in the final chapter of this paper.

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CHAPTER 1

INTRODUCTION

Scenario 1

Will, a high school student, sat in front of the computer wearing a headset and reading into the computer the required text for the speech recognition program Dragon NaturallySpeaking (DNS). The text he read turned from black to gray indicating it had been read. Suddenly all the text turned black, and Will was prompted to reread the passage. “It’s evil!” shouted Will with a light-hearted voice and a grin on his face when he realized he had to reread the text.

“It’s not evil,” responded Dee, smiling and holding back her laugh.

Will turned his attention back to the computer, clicked the mouse, and read the required text only to find himself rereading the material several times before the program accepted his dictation and allowed him to proceed to the next paragraph. As Will continued to read the story, the problem occurred several more times. After investigation of the computer and the program, the technology specialist identified the problem as a loose sound card. The problem was soon corrected.

Scenario 2

Michael, a freshman in high school diagnosed with autism, had read three stories for the DNS speech recognition program during previous sessions and learned a few commands. During the sixth training session, Michael dictated a few sentences and corrected the errors. As he gave verbal commands and dictated, Dee reminded him that he needed to talk consistently in the same volume and at the speed he used when he read

the three stories for his voice profile. Michael continued to give commands speaking at various rates and in different voice tones. As a result, errors occurred. Utilizing the program for dictation beyond training did not evolve because of too many errors caused by Michael speaking in various voice tones, volumes, and speeds.

Scenario 3

Stephan, a high school sophomore, arrived at the office for a speech recognition session; six months had passed since his first training session. Stephan rolled his wheelchair up to the computer. Before proceeding, he picked up the roller ball mouse and moved it from the right side to the left side of the keyboard for access because of limited mobility in his right arm. Dee clicked on the iListen icon to open and start the program and said, "I am just helping you get started here, Stephan."

After placing the headphones correctly on his head, Stephan turned the microphone on and dictated, "Today-is-Tuesday-January-29-2002," with distinct pauses between each word. Noticing that the computer interpreted all of the words incorrectly, Stephan turned the microphone off. Dee asked him to dictate two additional sentences without stopping. He turned on the microphone and dictated, "Let's try this again." He paused before continuing his dictation, "Please do not screw up."

Stephan then watched the words appear on the screen. As he witnessed errors, he said, "The computer is making me really mad. It better get this right." Stephan paused again and said, "Let's try this again. One more time period." When Stephan saw errors continuing, he responded, "I did not say 'period.' No! No! No computer."

Stephan turned the microphone off. Turning to Dee, he expressed, as he had in the past, he did not want to take the program home until it worked. He continued to state that the program should work by now because he had read numerous stories. Dee explained to Stephan that the program was designed for professionals, such as doctors and lawyers, who were very articulate and had a continuous speech pattern. After several months of training, Stephan decided to stop the sessions and investigate other programs available and better suited for his use.

These three scenarios provide a glimpse into three high school students' trials and tribulations with speech recognition training. In the first scenario, Will encountered difficulty from a loose sound card that would not allow output and input of audio signals from the computer to either speakers or headphones. This relatively minor problem could be a major barrier for students or adults unfamiliar with the technology. Michael, the student in the second scenario, dictated using different speeds, volumes, and pitches, resulting in numerous errors. In the third scenario, Stephan experienced difficulty because his speech impairment interfered with the program. In order to create a voice profile, the program required the text to be read in a continuous fashion with short or no pauses between words. Due to his disability, speaking without pauses was hard for Stephan. He spoke three to four words and then needed to pause for several seconds to take a breath.

My Experience

My adventure with speech recognition software started when my supervisor asked me to investigate this area of assistive technology. As a research assistant my responsibility was to train students to use various pieces of technology. I was quite excited to get started with this project. I thought, "If I don't have to type, I'm game."

First, I determined the most practical programs for participating students. I examined three programs compatible with Macintosh and/or Microsoft Windows platforms. These programs were Dragon NaturallySpeaking (DNS; Lernout & Hauspie, 2000), iListen 1.0 (MacSpeech, 1998), and ViaVoice (International Business Machines, 1999). Since my first encounter with speech recognition software, new editions of these programs have been developed. I began with DNS 5 (Lernout & Hauspie, 2000) and advanced to DNS 7 (ScanSoft, 2002). Upgrades also occurred with iListen and ViaVoice. In addition, the two separate companies that produced DNS and ViaVoice have changed over the course of the years. ScanSoft now owns both programs.

Dragon NaturallySpeaking

On a wintry day in January 2001, I sat in my office and proceeded to download DNS Version 5, Standard Edition, onto my Gateway computer. I began to create my voice profile by reading several of the stories provided with the program, including "Charlie and the Chocolate Factory." Reading the stories was required in order for the computer to create a voice profile, which assisted in recognition of the user's speech during dictation. I completed the first story before moving on to the tutorial for first-time users. The tutorial provided clips, directions on how to use the various voice commands,

and opportunities for practice. After each section, I practiced using the commands that controlled the microphone and maneuvered the cursor within the document. Commands practiced were *wake up* and *go to sleep*, which turn the microphone on and off. I learned other commands allowing me to spell words (e.g., *D-E-L-A-N-N*), delete text (e.g., *delete that*), move within the document (e.g., *move up one line*), and correct errors (e.g., *select [word]*). After one hour, I stopped for the day. My initial reaction to this program was “Cool! This isn’t that bad and it isn’t hard.”

On the second day, I read a second story for the DNS program because adding to my voice profile would increase the accuracy rate. After reading an excerpt from the story, “Alice’s Adventure in Wonderland,” identified as an easy read, and saving the files, I read a paragraph from the iListen manual into the speech recognition program. The DNS software had an accuracy rate of 83% or 16 errors out of 95 words, after two stories were read.

I read a third story called “2001: Space Odyssey” and saved my DNS voice files. I proceeded to read a paragraph from the iListen manual into the DNS program. My accuracy rate after reading three stories was 82 percent. After correcting errors, I began practicing various commands for 30 minutes. Several minutes were spent struggling with the *wake-up* command for DNS, which turned the microphone on so dictation could occur. The remaining time, I spent learning and practicing other DNS commands before quitting for the day.

I began learning the standard version of DNS. I found this particular speech recognition program easy to use and fun! A few years later, I acquired the updated version of DNS, specifically the Preferred Version of DNS 7.

I personally found the additional features on the preferred version to be very helpful. Three features were the read back, playback, and dictation options. The read back feature available only on the preferred, professional, and higher versions of DNS programs reads the text in the word processing document in a computer-generated voice. As each word of the text is read, the word becomes highlighted. The user has the option of having a line, paragraph, document, or entire text in the window read.

The second useful feature of the DNS program was the playback feature. This allows the user to hear what they have dictated. As dictation occurs, the user's voice is recorded. The playback feature plays the user's dictation while simultaneously highlighting the text, allowing for identification of any errors. At first, listening to my voice was distracting, but I grew accustomed to it.

The third capability of this program was the option to dictate into either Dragon Pad, the word processing document provided with the program, or into Microsoft Word (MSWord) or Corel WordPerfect. All DNS editions allow for dictation into other word processing documents. This accessibility feature allows users to dictate into a word processing document of their choice.

I found two discouraging features of DNS. First, the program lacked spelling and grammar check in the word processing document SpeakPad. Second, the program was

only compatible with Windows platforms. Students who have Macintosh computers do not have the option of using DNS.

iListen

The second day of my investigation of speech recognition software, I began investigating the program iListen Version 1.0. I expected this program to be similar to DNS. In other words, it would be easy to use and create my voice profile. I noted the iListen program was designed for Macintosh computers only; therefore, I loaded the program onto my Macintosh computer and followed the directions to create my voice profile. Before I began learning the software program, I questioned the usefulness of this program for students with limited mobility because errors needed to be corrected with the keyboard and mouse.

The process of creating a voice profile for iListen was similar to that of DNS and consisted of two steps, select and read the material provided. However, two differences existed. First, the iListen program required reading a list of single words (i.e., one, two, three, four, five). Second, saying the punctuation marks while reading was mandatory (e.g., “When dictating comma the user must ensure proper placement of the headphones period”). During the process of creating my iListen voice profile, I encountered difficulty. I had to repeat the phrases “the training text period” and “no interfaces period no modules period” several times before the program accepted my pronunciation, and I could proceed.

After completing the first story and saving my voice file, I dictated a small paragraph from the iListen manual and dictated a few impromptu sentences. Next, a bell

began to ring approximately every five seconds. I could not figure out what this meant, but continued dictating all the same. Puzzled, I stated aloud, “Why is the computer ringing?” After searching the manual for a reason and not locating an explanation for the ringing, I ignored the alarm bell and read a second paragraph from the manual. When I stopped dictating, I counted a total of nine errors. Despite my frustration with the ringing, I consulted the manual on how to read a second story for my voice profile. At one point, I even told the computer to “hush.”

I ventured onto a second story and proceeded to read paragraphs from the manual to the iListen speech recognition program. I noted several errors in the sentences but continued to read two more paragraphs from the manual. Unsatisfied with the dictation accuracy, I decided to read another story. Once again, I read a paragraph from the iListen manual after I finished reading the third story. After the three stories, I calculated the program’s accuracy rate to be 83 percent. I spent the majority of the morning creating my voice profile for iListen; longer than I had expected. I found the iListen program had an easier voice profile enrollment process than DNS.

After learning the program iListen and reading the manual, I remained skeptical, as the program did not allow for movement within a word document using voice commands. In addition, correcting errors with voice commands was not possible. This immediately raised the question: For whom was this program designed? Despite my hesitations towards the program, I created a voice profile by reading three stories, learned the few commands, and practiced dictating. After learning the program, I confirmed my hypothesis. Individuals using this program would require the ability to access the mouse

and keyboard. Obviously, this program would not suit everyone's needs because users with limited or no access to the keyboard or mouse would remain unable to utilize the program.

One of the features of the iListen program I found useful was the "skip" button available during the enrollment process of reading stories for the creation of a voice profile. Unlike the other programs, DNS and ViaVoice, the user has the option of skipping a word when he or she encounters difficulty with the pronunciation. Even though the *skip* button is available with iListen, it should be used sparingly to ensure the creation of a complete voice profile.

In 2003, a new version of iListen became available. The updated version enabled the user to make corrections and maneuver within the dictated text using one's voice. The ability to use voice commands eliminated some of my concerns with the program. Dictation into any word processing document was now available.

ViaVoice

On the third day, I started learning a third voice recognition program called ViaVoice, Enhanced Edition. Designed for either Mac-or IBM-compatible computers, I installed the program on a Macintosh computer. I assumed this program would be easy, but I soon learned otherwise as I clicked the *continue* button and followed the directions appearing on the screen. While reading the first story, the computer "beeped," indicating for me to go back and reread the text starting from the underlined word. Having to reread and listen to the beeping sound became very aggravating. After reading three stories, the

next step was to learn the voice commands allowing me to maneuver within the document.

Several attempts to dictate using ViaVoice were made. I became extremely frustrated due to the number of errors that appeared. For some reason unknown to me, the program interpreted my dictation as a combination of numbers and letters (i.e., OM0PLU9U). Unable to contain my frustration any longer, I consulted a colleague who downloaded a newer version of ViaVoice. After trying the new version and a different brand of headphones, I read two more stories and dictated a paragraph. Once again, what I refer to as “garbage”— a combination of letters, numbers, and/or symbols— appeared.

At that point, I began to examine my abilities. Perhaps the program was not designed for female users. This thought entered my mind when a colleague commented that males designed speech recognition programs for white-collar male professionals. Recognizing that women’s voices have higher pitches, I immediately thought, “the program isn’t female-friendly.”

My second thought was, “I have a speech impairment. Maybe those speech services I received as a child did not pay off.” I began to doubt my ability to articulate clearly. As my search for answers continued and my enthusiasm for this program faded, I could not imagine a student with a speech impediment succeeding with ViaVoice.

Two days later, my colleague created his own voice profile for the ViaVoice program. He dictated and used various commands; he also received *garbage*. As we worked on the program throughout the day, he identified the source of the problem. Due to unclear pronunciation of the word *end* when the *end spell* command was given, the

computer did not comprehend my command. I finally experienced success when I pronounced the word “end” with an enunciated *d*.

ViaVoice became more frustrating as I encountered other errors (e.g. substitutions, omissions). After learning the commands, I tried to correct my mistakes, but the program did not interpret my commands correctly. This program required precise enunciation and pronunciation. The program would accept short “a”, but not the long “a.” ViaVoice also had multiple-step commands, which required additional memorization. Spelling a word used a three-step process: (1) say “begin spell”, (2) spell the word one letter at a time (e.g., D-E-L-A-N-N); and, (3) say “end spell”.

iListen also required a three-step process involving: (1) saying, “Switch to spelling mode,” (2) spelling the word letter by letter; and (3) saying, “Switch to dictation mode.” Dragon NaturallySpeaking required only two steps, “spell that” followed by the spelling of the word.

When I started learning the software ViaVoice, my impression of the program was less than positive. I realized the problems I encountered with the program were a result of my unclear pronunciation; however, the negative encounter left residual feelings of frustration and unwillingness to use the program.

Despite my negative feelings, I found the ViaVoice program had three useful features. Two of these features were playback and read back. Identical to the playback and read back found with the DNS program, these two features have the potential of assisting students with editing their written documents. Playback stores the user’s dictation, up to a 1000 words or until the program is shut off. Similar to DNS, the

playback for ViaVoice does not read typed text nor imported text. In addition, it should be noted the program only allows for approximately 30 minutes of dictation to be saved (approximately 40 MB). The read back feature in both ViaVoice and DNS reads all typed text in the word processing document using a computer-generated voice.

Nevertheless, when utilized in ViaVoice, the text is not highlighted. While the user of the program can hear the dictation of typed text, the individual does have to follow along closely to identify the location of the errors.

I was impressed by the three speech modes available on ViaVoice OSX that offered the option of choosing: dictation only, command only, or both dictation and command mode. Dictation mode allows for the speech recognition program to accept dictation only. Therefore, navigation within a document cannot occur. As an example, when the program receives the command *move to end of page*, the cursor will not move to the bottom of the page; it will, however, type the dictated word or phrase. Command mode only permits navigation of the cursor; consequently, dictation will not take place. Dictation and command mode allows for either dictation or navigation to occur. This allows for an individual to dictate and correct errors simultaneously. A final plus for ViaVoice is the availability of the program for both platforms, IBM compatible and Macintosh.

I had two concerns with ViaVoice. First, a few of the program's features were only available with the program's word processing document SpeakPad. When an individual dictated into a word processing document, such as MSWord, the command

mode remained unavailable, allowing only dictation to occur. This prohibited errors from being corrected by voice; thus, the keyboard must be used.

Second, incorrect punctuation or grammar cannot be identified when SpeakPad is accessed. Grammar and spell check, a feature available on other word processing software, such as MSWord or Word Perfect, remains unavailable with the writing application SpeakPad in ViaVoice and Dragon Pad in DNS. Dictating into other word applications allows the user to access the spelling and grammar check.

After learning each speech recognition program, I used the programs for dictating session training notes for students. I dictated session notes using the program the student was learning. I also used the DNS program in the privacy of my own home for course-related assignments.

Researcher's Perspective

I recognized the potential benefits of using speech recognition programs. First, the program eliminated the need for typing, allowing students who had limited access to the keyboard or mouse opportunity to use the computer. A second benefit was dictation is faster than typing (Booth, 1989; Lee, Hauptmann, & Rudnisky, 1990; Mac Arthur, 1999). This was an advantage for those students who had not acquired typing skills and had limited accessibility to the keyboard. The third advantage was correct spelling.

After learning the programs and using them for different purposes, I remained skeptical. As I approached this research, my skepticism remained because of my personal use with speech recognition programs. My observations of student learning and

their limited use of software programs (e.g., “Co:Writer”, “Write out Loud”) also influenced my uncertainty. I questioned the practicality of these programs.

During my experience using speech recognition programs in the home and work environment, several questions regarding the practicality of the programs emerged. First, would students use speech recognition once trained? Even though accessible on my computer, I did not use one particular speech recognition program because I did not like the commands required. Noise interference was a second reason for my skepticism. I questioned how noise in the environment would interfere with the program. Third, I questioned how a roommate would react to and influence one’s use of a speech recognition program and how practical these programs were for use in a dorm room. I utilized one speech recognition program in my home and workplace and felt uncomfortable using the program with others in the same room. A fourth concern remained regarding the availability of technical assistance to students should they experience difficulty with the program. The fifth reason for my skepticism was the fact that users, for numerous reasons, often abandon equipment. Influential causes of abandonment are design factors, lack of user input, and cost (Scherer, 1993).

As I trained students and personally used the programs, I became intrigued with several questions: What are the practical uses of speech recognition programs? What do students like and dislike about these programs? Is one program better than another? In addition, I became interested in how students would use the programs in different environments when different academic demands were placed on them. I also questioned how the environment would affect the speech recognition program.

My inquiry into the utilization of speech recognition programs by postsecondary students with learning challenges was approached with existing relationships, prior personal experience with the speech recognition programs, and skepticism. Prior to this research, teacher-student interaction with the participants had existed between two months and two years. I had previous contact with the participants when I provided training and assistance with other software programs. The rationale for using existing relationships was that hopefully the participants would talk honestly and avoid providing me information they thought I wanted to hear. Furthermore, these established relationships would allow for more time spent gathering rich detail of their experiences and thoughts, rather than establishing only rapport and trust.

To achieve accurate understanding, I had to use precise probing questions to ensure I did not assume to understand the participants' perspectives because of our existing relationships. Due to these relationships, students may not have wanted to cause hurt feelings. In addition, the students in this study participated in a grant project that provided them with their computer; therefore, they may have felt an obligation to take part in this research or use their speech recognition program.

My personal knowledge and experience with three speech recognition programs for various activities, such as dictating research notes, text notes, and course requirements, assisted in effectively probing participants, asking specific questions, and interpreting the data. In addition, my experience and knowledge of the programs allowed me to answer students' questions about the program. Observations of participants

utilizing the programs and interviews were implemented to understand students' feelings and thoughts on the speech recognition program they used.

Further, I perceived the students to have valuable insights. To address research bias, I carefully listened and observed, probed, and obtained feedback from participants to avoid misinterpretations. For the purpose of evaluating my personal subjectivity, I also kept a reflective journal for recording my thoughts, questions, and observations after each interview.

Initial Assumptions

Several assumptions were made. These assumptions included the following:

1. Success of assistive technology as a tool depends on a number of issues and factors that are complex and interrelated.
2. Individualization is a basic premise of special education; therefore, naturalistic inquiry was required to describe and explore students' experiences related to speech recognition as an assistive tool.
3. It is vital to listen to and value the perspectives of those individuals who are frequently unheard.

Problem Statement

The number of students eligible for academic accommodation services and pursuing higher education has increased over the years (U.S. Census Bureau, 2001). Demands on these students are intense, and assistive technology can help meet these requirements. One such tool is speech recognition. These programs have been identified as a beneficial assistive technology device for students with disabilities (Cavalier &

Ferretti, 1996; Raskind, 1993; Raskind & Higgins, 1998, 1999). Raskind and Higgins (1998) specifically identified speech recognition programs as an appropriate tool for postsecondary students with learning disabilities whose oral language skills exceed their written language abilities.

Speech recognition is an alternative input device to the conventional method of using a keyboard. As an individual dictates into a microphone, the text appears in a word processing document. Designed originally for the white-collar professional, these programs have evolved into an assistive tool recommended for people with limited access to computers.

To date, few studies have explored speech recognition software. The initial results of those studies indicate that this technology has promise, but a number of unexplored issues pertaining to the use of speech recognition programs raise questions about the programs' practical use for postsecondary students who have academic challenges, or receive support services (e.g., note-takers, readers, books on tape). For example, existing research has failed to describe the environments (e.g., home, computer lab, classroom) in which the programs have been used. Other potential distractions, such as noise or the presence of other people, have not been addressed in the literature. Moreover, the majority of the existing research has investigated the use of speech recognition programs to dictate papers.

While dictating papers is certainly one legitimate use of these programs, other important uses remain unexplored (e.g., taking notes, surfing the Internet, chatting). In addition, the question remains: Do students use speech recognition programs after they

have completed training and monitoring by a professional no longer exists? Finally, research has not focused on understanding the personal perspectives and viewpoints of students utilizing speech recognition programs.

Purpose of the Study

In this study, I attempted to bring the voices of speech recognition users to the forefront by acquiring an understanding of how five postsecondary students with learning challenges used speech recognition programs. This study provided a different perspective in an area of research that has primarily been approached from a positivist conceptual framework. The exploration of how postsecondary students used speech recognition programs in the natural academic context over the course of one college year (fall and spring semester) was examined. In addition, this research allowed the perspectives and viewpoints of students using speech recognition programs to emerge.

Realizing the need for naturalistic inquiry, a case study method was implemented. This study was designed to: (a) understand how students utilized speech recognition programs, (b) make meaning of their experiences and perspectives, and (c) understand how the stimulus characteristics of different environments (e.g., home, work site, residential hall) affected how students utilized speech recognition software. Case studies allow for the researcher to examine a setting, subject, or event in detail by becoming a participant in the environment studied (Bogdan & Biklen, 1998). Therefore, the researcher is involved with the phenomenon being investigated (Gall, Borg, & Gall, 1996) and is “the primary instrument for data collection and analysis” (Merriam, 1998, p.

7). As the researcher, I observed, questioned, and interacted with the participants, as well as reviewed documents dictated by them.

Research Questions

The questions explored in this research were related to how postsecondary students with learning challenges used a speech recognition program as a tool to assist in meeting academic demands. Specific questions guiding this research were:

1. How do students with learning challenges perceive the speech recognition training process?
2. After training is completed, how do students utilize speech recognition programs for college academic demands over an extended period of time?
3. What are the positive and negative factors in the natural environment that affect students' utilization of the programs?
4. In what ways do students appear to benefit from speech recognition programs?

Significance of the Study

This study yielded crucial information not currently available in the research literature on speech recognition. By exploring postsecondary students' perspectives on speech recognition programs, this study contributed new information to the present literature. This was accomplished in several ways.

First, the experience of using a speech recognition program to meet the academic demands of postsecondary education was investigated from the students' perspectives, an approach not found in the speech recognition literature. Second, the study occurred over an extended period of time. The investigation of speech recognition programs completed

previously has occurred over the course of only 10 to 16 weeks with individuals having limited access to computers and speech recognition programs for 20 to 50 minutes a week (Raskind & Higgins, 1999; Wetzel, 1996). This study occurred over an extended investigation period, two semesters, and allowed students unlimited access to the programs. Third, this study occurred in the students' natural environments (e.g., residence hall rooms or the students' homes).

Definition of Terms

The fields of technology and education use their own individual idioms to communicate. Specific terms utilized in this research study are defined for both categories. A group of words used in the speech and voice recognition literature is presented, followed by definitions of terms in the education field.

The terms, *speech* and *voice recognition*, are often used interchangeably in the literature. In this study, I draw a distinction between them. Speech recognition and voice recognition are defined based on a software program's output. Speech recognition is defined as a dictation program that requires voice input and has typed text as the output. Markowitz (1996) identified four different functions speech recognition programs serve: (a) command and control—allowing for verbal control of equipment or software, (b) data entry—voice input for tasks such as placing an order, (c) data access and information retrieval, and (d) dictation for the purpose of creating letters, reports, etc. The term speech recognition will be used to refer to a software program that creates a written document by talking to a computer. Voice recognition will refer to programs that allow for control of one's environment, data entry, and retrieval of information.

The following terms are used in the speech and voice recognition literature:

Continuous speech—a program allowing words to be spoken without pausing between words (Wetzel, 1991).

Discrete speech—a program that relies on a pause of a few seconds between each spoken word (e.g., Today–is–Monday–the–23rd–period; Wetzel, 1991).

Sound card—a circuit board that permits sound to be played through speakers and received through a microphone (Newman, 2000).

Speaker dependent—a program where the user trains the system by reading provided stories into the program in order to create a voice profile that allows the program to recognize the enunciation and inflections (Ruley, 1994).

Speaker independent—programs that require little or no training prior to use and accept anyone’s voice (Milheim, 1993; Ruley, 1994).

Text box—a box containing words the user reads during the creation of his or her voice profile.

Voice profile—the user’s saved voice files. The user reads prepared stories into the speech program, and the pronunciation of the user’s words is saved.

The second group of words defined is used in the field of education. Disability is “a physical or mental impairment that substantially limits one or more major life activities” (Americans with Disabilities Act 1990, 42 U.S.C. Section 12102). The term *disability* is not defined by the Iowa Department of Education. Rather, the phrase *eligible individual* is used in the Iowa Administrative Rules of Special Education to refer to “an individual with a disability who is handicapped in obtaining an education and who is

entitled to receive special education and related services” (p. 4) during the course of his or her K-12 education. At postsecondary institutions, the Americans with Disabilities Act (ADA) definition is used to identify those students eligible to receive accommodations, if they qualify after they have self-identified themselves to the appropriate office.

The phrase *learning challenge* will be used in this study to refer to students who experience difficulty with learning. These students may or may not receive academic accommodations during their postsecondary careers due to ineligibility or not requesting services.

In this study, *postsecondary education* refers to any setting beyond high school to which adults have access and requires completion of course requirements. Any educational setting such as a community college, a four-year institution, a commercial training program, an apprenticeship, or a branch of the armed services is considered a postsecondary institution.

Assistive technology is defined in The Individuals with Disabilities Education Act Amendments (IDEA) of 1997 as “any piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain, or improve the functional capabilities of a person with a disability” (IDEA, 1997, 20 U.S.C. § 1401[1]). In addition “assistive technology is not aimed at ‘curing,’ ‘fixing,’ or ‘remediating’ disabilities, rather a strategy to compensate for, or circumvent, a disability” (Raskind, 1993, p. 185). A piece of technology used to correct impairment is referred to as a cognitive prosthesis (Margolis & Michaels, 1994).

An *accommodation* is a modification or adjustment. The term *accommodate* is defined in the Webster's Dictionary as "to render fit or suitable; adapt; reconcile; provide room for." In the Americans with Disabilities Act of 1990, the term accommodation is not defined, rather the term *reasonable accommodation* is discussed as follows:

(A) making existing facilities used by employees readily accessible to and usable by individuals with disabilities; and (B) job restructuring, part-time or modified work schedules, reassignment to a vacant position, acquisition or modification of equipment or devices, appropriate adjustment or modifications of examinations, training materials or policies, the provision of qualified readers to interpreters, and other similar accommodations for individuals with disabilities.

Duston, Russell, and Kerr (1992) defined "reasonable accommodations" as:

1. modifications or adjustments to a job application process that enable a qualified application with a disability to be considered for the position just as any qualified applicant; or,
2. modifications or adjustments to the work environment or to the manner of circumstances under which the position held or desired is customarily performed that enable a qualified individual with a disability to perform the essential functions of that position; or,
3. modifications or adjustments that enable a covered entity's employee with a disability to enjoy equal benefits and privileges of employment as are enjoyed by its other similarly situated employees without disabilities (p. 217).

Currently, the definition refers to employment settings. A clear definition of reasonable accommodations pertaining to the educational setting does not exist. In the employment environment context, reasonable accommodations require employers to provide modifications in the environment that eliminate existing barriers. The Federal

Regulations suggest accommodations for students with disabilities may include allowing students extended time to complete a program or offering various devices and services. The Americans with Disabilities Act of 1990 was used to assist in defining accommodation in this study as an adjustment or modification allowing an individual opportunity to demonstrate his or her ability.

The final set of words defined refers to dictation errors. To assist in understanding the types of dictated errors encountered during this study, I developed a few definitions that identify the type of mistakes witnessed.

Dictation—a form of writing completed by speaking words spontaneously to a speech recognition program.

Insertion—additional text not dictated but added by the speech recognition program.

Multi-word substitutions—a series of spoken words misinterpreted as a series of another set of words.

Omission—dictated words omitted from text by the speech recognition program.

Substitution—a spoken word misinterpreted as another word.

CHAPTER 2

LITERATURE REVIEW

Studies focused on speech or voice recognition programs used by individuals with disabilities were reviewed in this chapter. Disability was defined as “a physical or mental impairment that substantially limits one or more major life activities” (Americans with Disabilities Act 1990, 42 U.S.C. § 12102). This definition was used throughout the review to describe the participants of the studies.

First, various types of speech recognition programs are defined. Second, current research on these programs is summarized. Participants, independent and dependent variables, and results of the studies are reported. Limitations of the research are then presented.

The articles selected were located through a three-step process: (a) a search of Educational databases (i.e., Educational Resources Information Center [ERIC], PsychINFO); (b) a search of dissertation abstracts; and (c) a search of references included in documents obtained. Search terms used were *speech recognition*, *voice recognition*, and the names of software programs (i.e., Dragon NaturallySpeaking, ViaVoice, iListen). Articles located were published between the years 1979 and 2005.

Speech Recognition Software

Speech recognition software is an alternative input mode for computers; keyboards and mice are traditional methods. Speech recognition allows an individual to dictate into a microphone to produce text in a word processing document. Two types of speech recognition input systems are available: speaker dependent and speaker

independent (Highland, 1997; Ruley, 1994). Speaker dependent refers to input systems that require training in order for the individual's voice to be recognized by the computer. During training, the speaker creates a voice profile by reading program-provided stories into the computer. This profile allows inflections and enunciation to be recorded for future recognition. Speaker independent input systems require little or no training "and can be utilized by a large group of users who have had no previous contact with the system" (Milheim, 1993, p. 19).

Speech recognition software is categorized as either discrete or continuous. Discrete programs rely on a pause of a few seconds between each word (Wetzel, 1991). Continuous speech programs allow for words to be spoken without pausing (Wetzel, 1991).

Originally developed in the 1950s, speech recognition programs became popular during the 1980s and 1990s. Woodbury (1959) claimed that, at the time of his article, machines capable of reading print (speech synthesizers) existed. He also noted the Bell Telephone Company laboratories had a machine with the capabilities to listen and repeat spoken numbers, as well as a few phonetic sounds. During the 1960s and 1970s, a number of research projects existed that worked to develop continuous speech programs (Lea, 1980). In 1972, the first commercial speech recognition product appeared, and the development of continuous speech continued (Lea, 1980). During the late 1980s, a speech recognition program, SPHINX, was introduced that accepted continuous speech. With the ability to recognize 997 words, it was considered to have a large vocabulary (Waldrop, 1988). Today, programs recognize approximately 200,000 words.

Software companies developed and marketed speech recognition software assuming the programs would increase a user's productivity (Hartley, Sotto, & Pennebaker, 2003). Speech and voice recognition programs have been used in the professions of medicine, business, engineering, and education. Doctors use speech recognition software for completing medical reports (Devine, Gaehde, & Curtis, 2000). In the business world, voice programs are used for data entry and machine control (Andrea, 1989). The military uses voice recognition with flight simulators (Dendy, 2001). In addition, the programs have been explored in education as reading tutors (Mostow & Aist, 1999) and tools for retrieving information in libraries (Witbrock & Hauptman, 1998). Recently, speech recognition software has been used as a tool for collecting research data in a semi-natural environment (White, King, & Duncan, 2002).

Speech recognition programs have been recommended for slow typists and individuals who have few keyboarding skills or limited typing abilities (Danis & Karat, 1995). Lai and Vergo (1997) noted that speech recognition programs might be better tools for users who are non-typists.

Speech Recognition Research

Speech Impairments

Fried-Oken (1985) investigated voice recognition as a tool for individuals with speech impairments. The two participants in her study were a 10-year-old boy who had C1-C2 quadriplegia and a 19-year-old man with a head injury and C6 spinal cord injury. Using an unspecified speech recognition program for activating computer programs over

multiple sessions, the boy achieved a recognition rate ranging from 40 to 60%, while the young man reached recognition rates of 79 to 96 percent.

In a study completed by Coleman and Meyers (1991), 10 adults identified with cerebral palsy and dysarthria and 13 non-disabled adult speakers used speech recognition programs in their work environments. The participants with dysarthria ranged in age from 20 to 45, and the age of the non-disabled adults ranged from 23 to 53 years. Participants used a speech recognition program, Shadow VET 2, loaded on an Apple IIe computer. Participants without disabilities required only a single 1-hour session, and the remaining participants required two to four 1-hour sessions.

The adult participants read words grouped into four categories. The first group consisted of 12 words beginning with a consonant and “followed by a neutral vowel” (p. 37). The second list of 12 words began with the letter *h* and ended with the letter *d* (e.g., *hed, hid, heard*). The third set of 12 words was taken from a list of words identified as easy (e.g., *barb, groove, train*), while the fourth list of words was perceived as difficult (e.g., *cookbook, mushroom*). Results indicated the program recognized the adult speakers with cerebral palsy and dysarthria at a lower rate than the speakers without disabilities. The authors concluded the pattern of correct speech recognition for the two groups was similar as the program recognized fewer consonants than vowels for both groups.

Thomas-Stonell, Kotler, Leeper, and Doyle (1998) reported similar results. The authors reported the accuracy for the program VoiceType was higher for the non-dysarthric speakers than the participants identified with moderate or severe dysarthria.

Six participants with and six without dysarthria, between 15 and 55 years of age used the IBM program for completion of sentences during five assessment sessions.

Hux, Rankin-Erickson, Manasse, and Lauritzen (2000) investigated three different speech recognition programs with two female participants. The first participant was an 18-year-old identified with dysarthric speech. The participant without dysarthria was a 28-year-old. Each participant used the following three speech recognition programs: Dragon NaturallySpeaking 3.0 (continuous speech), Microsoft Dictation (continuous speech), and VoicePad Platinum (discrete). After completing training each participant read 10 sentences to the speech recognition program and composed 10 sentences. Prior to dictation of each spontaneous sentence, the participant was provided with a key word to include in the sentence and a few minutes to quietly generate a sentence before dictating it to the computer. Results indicated the speech recognition program Dragon NaturallySpeaking had a higher accuracy rate than the other two programs for both speakers. All three speech recognition programs had a higher accuracy rate of correct word recognition for the nondysarthric speaker.

Investigations of voice recognition programs used by individuals with aphasia have also been completed. Using a case study approach, Bruce, Edmundson, and Coleman (2003) investigated the experience of an adult male using Dragon NaturallySpeaking for completion of writing activities. The participant experienced success as his writing improved and communication occurred. Wade, Petheram, and Cain (2001) compared the performance of Dragon NaturallySpeaking Version 4.01 used by users with and without aphasic speech. In this study, the required reading of stories

was substituted with specific words and phrases. Again, the accuracy of the software program was higher for the control group, non-aphasic speakers.

Controlling the Environment

Brown and Cavalier (1992) explored speech recognition as a tool for controlling one's environment. The participant was an adult female, 41 years of age, identified with severe cerebral palsy and profound speech and mental retardation. Her speech consisted of vocal sounds and a few comprehensible words. Mobility was non-existent, and basic needs required continuous care. Within the participant's environment, four of her favorite activities were identified as equipment that could be controlled by voice. These consisted of a massage pad, radio, videotapes of family members, and a videotape of favorite stories read. A vocal sound was identified and assigned to each different piece of equipment and taught to the participant. The participant successfully learned a total of five different vocal sounds consisting of one vocal sound for activation per device and one vocal sound to turn off all four pieces of equipment.

Additional two studies were located investigating individuals with disabilities using speech recognition programs as a potential microswitch for controlling equipment within their environment. Lancioni, Singh, O'Reilly, Oliva, and Montironi (2004) used the speech recognition program Dragon NaturallySpeaking Version 6, standard edition with two adults with multiple disabilities. The participants were 20.5 and 18.9 years old. When the participants said one of their word utterances and was correctly identified by the program, the participant received the stimuli. During the postintervention, the speech program recognized over 75% of the first participant's word utterances. The second

participant was able to achieve a recognition rate of 71 percent. The authors concluded speech recognition programs have potential to be used as a microswitch for individuals with disabilities. Lancioni, Singh, O'Reilly, Oliva, Montironi, Piazza, et al. (2004) completed a similar study. In this study, two male adults, 15-and 20 years old participated. The first participant used software designed for the study. The program recognized 70% of the first participant's three utterances during post-intervention. The second participant used the program Dragon NaturallySpeaking and achieved a word utterance accuracy rate of 65 and 70% during post-intervention.

English as a Second Language

Coniam (1999) and Derwing, Munro, and Carbonaro (2000) explored the practicality of speech recognition programs for English as Second Language (ESL) speakers. Coniam (1999) investigated the accuracy of speech recognition programs used by 10 Chinese teachers who had obtained Master's degrees in the English language and were teaching English. Prior to the study, the participants read one of the required texts into the speech recognition program Dragon NaturallySpeaking, creating their voice profiles. This task took approximately 60 to 90 minutes. Speaking into the computer, each participant read a passage consisting of approximately 1,000 words. The software's accuracy of recognizing the speech of ESL speakers was evaluated by counting the number of correct words. The authors reported the speech recognition program to be more effective at recognizing the dictation of native speakers than ESL speakers.

Thirty adult participants, consisting of 10 Cantonese, 10 Canadian English, and 10 Spanish speakers, participated in the Derwing et al. (2000) study. The researchers asked

the question: Do speech recognition programs work with ESL speech? To answer this question, Dewing et al. assessed the accuracy of Dragon NaturallySpeaking Preferred with ESL speech.

Ranging in age from 17 to 50, the participants used the software program Dragon NaturallySpeaking Preferred. The study consisted of three phases. The first phase was completion of the speech software training. Prior to creation of their voice profile, each participant was provided a practice reading session allowing them familiarity with the story and any unfamiliar words. In the second phase, participants read 60 true/false sentences into the computer. In the final phase, listeners scored the participant's transcription. The program's accuracy rate for the non-native English speakers ranged from 71-73 percent. This was almost 20% lower than the accuracy rate of native English speakers.

Academic Outcomes

Holmes, Andrews, Seegar, and Radcliff (1985) investigated speech recognition as a tool for students with physical disabilities, specifically participants who had difficulty accessing the keyboard. All five students selected were between the ages of nine and fifteen years and identified as having recognizable speech. The mode of composing written documents for three of the students was typing by hand. One student used a head pointer, and one used a mouth pointer. The speaker dependent program used in this study was a voice-activated program from Voice Machine Communications, referred to as Voice Input Module (VIM).

Participants used the VIM for approximately ten hours before they completed their voice exercises. Four of the five students demonstrated increased composing speed with the VIM (15 to 24 characters per minute) over their current composing mode (9 to 16 characters per minute). Using the mouth pointer for the fifth participant was faster (53 characters per minute) than the VIM (34 words per minute). The authors noted that while the participant demonstrated a high speed with the mouth pointer, maintaining this speed did not occur due to fatigue.

O'Hare and McTear (1999) examined speech recognition programs used in a classroom of twelve-year-old students. The authors observed 10 students to determine if the software improved their efficiency in creating written documents. They studied the outcomes of speech recognition as a tool to produce clearly written documents, decrease spelling errors, increase production time (dictation vs. typing), and use of the program in a classroom environment.

Using IBM's VoiceType 3.0 speech recognition program, students participated in two tasks. The first task consisted of three separate activities and required students to produce written documents through the means of paper and pencil, typing text into a computer, and dictating using a speech recognition program. Using the same story, the participants first wrote the story as it was dictated to them. They then typed the story, and dictated the story into the computer. The second task required students to dictate a story into the computer using the speech recognition program. The participants were provided with pictures to preview that represented a story and ten minutes of planning time prior to dictating. However, the students in this study were never asked to dictate

essays of their choice as visual cues were provided, which eliminated the spontaneity of dictation.

The number of errors in students' written documents under the three different writing tasks and the time it took students to complete the tasks were calculated. The authors reported students' dictated written documents contained fewer spelling errors and were produced at a faster rate than with handwriting or typing. The students' dictation took half the time of typing. Dictation for the students varied from three to four minutes, while typing ranged from 10 to 41 minutes and handwritten dictation took a total of 17 minutes.

Participants' handwritten dictation contained between three and 34 spelling errors, while the errors identified in the participants' dictation completed with voice recognition programs were due to misinterpretation by the program and consisted of seven to 70 errors. With regard to speech recognition programs in classrooms, the authors discussed considerations of speech recognition programs in the school and home environment in relation to (a) background noise, (b) location and portability of the computer, and (c) assistance available to the student for writing and technology problems. The authors were unable to draw conclusions regarding the effectiveness of speech recognition programs in a classroom.

Dictation has been noted to be faster than writing or word processing for students with disabilities (MacArthur & Graham, 1987). Although their participants did not use a speech recognition program, MacArthur and Graham noted that students' compositions contained fewer grammatical errors when dictated. The authors also observed improved

writing quality in students' stories. Investigation of text production through handwriting (paper, pencil or paper), word processing (Apple IIe computer), and dictating (speaking into a microphone) were explored. Eleven fifth and sixth grade students identified with learning disabilities participated. Each participant wrote a story using all three methods. The stories were to be written about a visual of a child/children engaged in an activity. Each participant composed a story. The stories were judged on the following eight elements: "main character, locale, time, starter event, goal, action, ending, and reaction" (p. 29). Points were received if elements were highly developed, more than one goal was present, events happened in a logical sequence, and more than one episode was described in the story.

MacArthur and Cavalier (2004) investigated the feasibility of speech recognition programs as a test accommodation for students. High school participants identified with and without learning disabilities composed handwritten and dictated essays. The 21 students labeled with learning disabilities (LD) and 10 peers without disabilities received six hours of individual speech recognition training using Dragon NaturallySpeaking Version 4. Participants wrote an essay under three conditions: handwritten essays using paper and pen or pencil, dictating to a scribe, and dictating using a speech recognition program. Students composed in a quiet room without distractions and were allowed unlimited amount of time to plan, compose, and revise their essays. Prior to composing, each participant received reminders to use the graphic organizer they were taught during training sessions.

Results of the students' essays indicated writing quality improved when essays were dictated. However, dictating to a scribe produced higher quality papers. Dictating to a scribe allows the speaker the opportunity to focus on content and their organization as opposed to the mechanics of typing and correcting errors.

Raskind and Higgins (1999) investigated the role of speech recognition in reading and spelling performance. Their participants used speech recognition to compose self-directed essays. A total of 39 students between the ages of 9 and 18 years identified with learning disabilities participated. Twenty of the participants were placed in the control group and the remaining 19 in the experimental group. All students received computer instruction for 50 minutes a week for 16 weeks. The students in the control group were enrolled in a keyboard class during the 16 weeks for the purpose of writing, interacting with text, and using the computer. These students composed their essays through keyboarding. The participants in the experimental group received computer and speech recognition training for composing written essays. Five of the 19 students used the speech recognition program VoiceType, while the remaining 14 used the program Dragon Dictate Version 2.5.

Speech recognition training consisted of two sessions devoted to creation of the user's voice profile and mastering the correction process. In the remaining sessions, students used the program for writing activities. Instruction for writing, spelling, or reading was not provided. Test scores indicated participants in the experimental group greatly improved their word recognition, spelling, and reading comprehension compared

to the 20 students in the control group who received computer instruction (Raskind & Higgins, 1999).

In a follow-up study, Higgins and Raskind (2000) compared discrete and continuous speech recognition programs. All of the participants attended a private school for children with learning disabilities. Nineteen students used a discrete speech recognition program 50 minutes a week for a total of 16 weeks to dictate compositions of their choice. In the second group, 13 students used a continuous speech recognition program. The control group received computer instruction for 16 weeks and was engaged in keyboarding. Activities involved tasks that required typing and using the keyboard and mouse to complete research and writing compositions. Other activities included playing games and participating in events requiring interaction with the computer. Differences among student outcomes were noted and attributed to the disparity existing between the discrete and continuous speech recognition programs. Four students who were using continuous speech programs dropped out of the study because the program had difficulty recognizing their voices. The authors noted these students were younger and had higher-pitched voices than the remaining students. Two students who were using discrete speech recognition programs dropped out because they were efficient typists and correcting speech recognition errors frustrated them. Scores revealed improved reading comprehension and word recognition of students who made use of the speech recognition program for writing papers (Higgins & Raskind, 2000). Students' grade levels were also noted to increase.

In a comparative study by Higgins and Raskind (1995), 29 postsecondary students labeled with LD, ranging from freshmen to graduate students, wrote under three different writing conditions: (a) writing without assistance (handwritten or word-processed), (b) dictating to a human transcriber, and (c) dictating to a speech recognition program. The students used the IBM compatible program Dragon Dictate Version 1.01 to complete the third writing condition. Prior to the study, the participants received one hour of training for learning basic operation and commands, one hour of learning correction procedures, and an unspecified number of hours of practice sessions continuing until each student demonstrated the ability to correct errors at a 90% proficiency level without assistance and expressed a comfort level with the accuracy rate of the program.

The authors reported “speech recognition assists students with learning disabilities in compensating for their difficulties in written composition” (p. 166). The authors also compared the students’ handwritten or word-processed compositions with dictated assignments and reported that the students who dictated had longer and better composed papers. Their findings were supported by research (Graham, 1990; MacArthur & Graham, 1987), in which students did not have spelling errors. Additionally, Higgins and Raskind (1995) noted students’ vocabulary had increased because the speech recognition programs focused on clear pronunciation rather than correct spelling. The students were not afraid to use words they could not spell. Finally, with the burden of correct spelling and neat penmanship removed, students could concentrate on content. Higgins and Raskind (1995) reported students had a higher holistic score on writing

samples composed with speech recognition programs because they used larger vocabularies during dictation.

Only one study examined preschool-age children using speech recognition software (Strommen & Frome, 1993). Thirty-six 3-year-old preschoolers were compared to 20 thirty-year-old adults. The participants used speaker dependant speech recognition software. Voice recognition was achieved by having participants identify pictures of Sesame Street characters (Big Bird, Cookie Monster, Elmo, and Grover) on the computer screen. The young children encountered more difficulty, as 36% of the users' voices were not recognized. One adult failed to train the program to recognize his speech for the name of one puppet character. While the program was effective and performed for the adult participants, it was less effective for the young participants. The authors concluded that childrens' articulation and vocal performance contributed to the difficulty encountered.

In an exploratory study, Wetzel (1996) provided a sixth grader identified with learning disabilities in the areas of reading and written communication with fourteen 30-minute training sessions. The student used the program VoiceType to compose written documents. Wetzel reported a less favorable outcome than other authors. The speech recognition program recognized only 74% of the student's utterances; therefore, correction procedures were required 26% of the time. Wetzel noted that these statistics would not be acceptable for "adults who were fluent readers and writers," and "this level of recognition is even less acceptable [for students]" (p. 376). The author stated the

student's difficulty could have been a result of the extraneous sounds made by the student (e.g., coughing, deep breathing) when the microphone remained on.

Work Related Outcomes

The participants in a study completed by Devine, Gaehde, and Curtis (2000) consisted of medical doctors ranging in age from 29 to 59. Twelve doctors utilized three speech recognition programs with medical vocabulary for the purpose of dictating medical reports (IBM ViaVoice 98, Dragon NaturallySpeaking, and L&H Voice Xpress). The participants completed the basic enrollment procedure recommended for the software and dictated two medical reports before completing required dictation trials for the study. Each participant dictated a progress note and a discharge summary. Errors were counted and measured separately for general and medical vocabulary, medical abbreviations, numbers, and punctuation marks. The total error rate (observed errors / possible errors) for the IBM software was 8.4% for the progress note and 6.62% for the discharge summary. The Dragon software had a total error rate of 13.88% and 12.03%, respectively, while the error rate for L&H measured 13.85% and 14.62 percent.

White, King, and Duncan (2002) explored speech recognition programs as a tool for completing work-related tasks. The speech recognition software program ViaVoice Millennium Pro Edition was used for data collection of behavioral research. Within a semi-natural environment, researchers spoke into a microphone and their dictation was transmitted to their computer for later use. The authors reported positive outcomes and recommend speech recognition programs used as a tool within various research settings.

A search of articles pertaining to individuals with disabilities using speech recognition programs to complete a work-related task was completed. No studies were obtained that investigated speech programs as a work-related tool similar to the studies completed by Devine, Gaehde, and Curtis (2000) and White, King, and Duncan (2002).

Summary of Speech Recognition Literature

Participants

The participants in the studies reviewed can be divided into two categories, ability and age. *Ability* refers to the classification of participants with or without disabilities. Persons without disabilities using speech recognition programs have participated in several studies. The participants in O'Hare and McTear's (1999) study were children without disabilities. Coniam (1999) and Derwing et al. (2000) investigated the practicality of speech recognition programs for English as Second Language (ESL) speakers. The participants in the study completed by Devine, Gaehde, and Curtis (2000) were medical doctors.

Studies completed by Higgins and Raskind (1995, 2000), Raskind and Higgins (1999), Wetzell (1996), MacArthur and Graham (1987), and MacArthur and Cavalier (2004) included student participants identified with learning disabilities. A few studies have included individuals with other disabilities such as physical and hearing impairments (Abdelhamied, Waldron, & Fox, 1990; Coleman & Meyers, 1991; Fried-Oken, 1985; Goette, 2000; Holmes, et al., 1985; Kotler & Tam, 2002). Speech recognition programs used by individuals with speech impairments have been explored (Carlson & Bernstein, 1987; Kotler & Tam, 2002). In addition, Manasse, Hux, and

Rankin-Erickson (2000) investigated the use of speech recognition programs by an individual with traumatic brain injury.

Participants in the studies reviewed can also be identified and grouped according to age: adults and children. *Adults* were individuals beyond high school, while *children* referred to students who had not completed secondary education.

Several researchers explored the use of speech and voice recognition programs with individuals beyond high school. For example, Higgins and Raskind (1995), Sanderson (1999), and Roberts and Stodden (2005) explored speech recognition with postsecondary students. Brown and Cavalier's (1992) participant was an adult female, 41 years of age. The ages of the adults in other studies have been between the age of 20 and sixty-eight (Coleman & Meyers, 1991; Kotler & Tam, 2002; Wade, et al., 2001). Speech recognition software used by 17- to 50-year-old adults who spoke English as a second language was also investigated (Coniam, 1999; Derwing et al., 2000).

Children have also been participants. O'Hare and McTear (1999) investigated speech recognition programs with students 12 years of age. Fifth, sixth, and seventh grade participants used speech recognition programs for dictating essays in De La Paz and Graham's (1997) study. The participants in Follansbee, Corley, and Lorin (2000) study were middle-and-high school-age students. Three studies focused on elementary-age students (Holmes, Andrews, Seegar, & Radcliff, 1985; MacArthur & Graham, 1987; Wetzel, 1996). Only one study examined preschool-age children using speech recognition software (Strommen & Frome, 1993).

Independent Variables

The independent variable in the research reviewed here was speech recognition programs. What differed across studies is the specific program used. Technology has improved rapidly; therefore, software and hardware now have features which were previously non-existent. Many different speech recognition programs have been studied. For example, the software program known as Dragon has been the independent variable in many studies, and the versions have consisted of Dragon Dictate Version 1.01 (Higgins & Raskind, 1995), Dragon Dictate Version 2.5 (Raskind & Higgins, 1999), DNS Preferred 2.0 (Halverson, Horn, Karat, & Karat, 1999), and DNS Version 1 (Higgins & Raskind, 2000). Follansbee et al. (2000) used a Dragon Dictate program. Dragon NaturallySpeaking 3.0 was used by participants in Hux et al., (2000) study.

Other programs used included VoiceType (Wetzel, 1996). O'Hare and McTear (1999), and Raskind and Higgins (1999) used Version 3.0 of VoiceType. Halverson et al. (1999) utilized ViaVoice 98 Executive. In addition, Halverson et al. (1999) investigated the speech recognition program L & H Voice Xpress Plus. Microsoft Dictation and VoicePad Platinum were used by participants (Hux et al., 2000). Investigations of speech recognition programs have also included both discrete and continuous programs.

Dependent Variables

The dependent variables in the studies reviewed included reading comprehension, spelling, text production, and word accuracy of the software. Raskind and Higgins (1999) and Elkind, Black, and Murray (1996) focused on improvement in reading and spelling through the use of speech recognition. Writing performance, word recognition,

and reading comprehension are other skills that have been explored (Higgins & Raskind, 1995; Higgins & Raskind, 2000).

MacArthur and Graham (1987) investigated text production. Participants composed a story using three methods: handwriting, word processing, and dictating to a human transcriber. O'Hare and McTear (1999) explored students' production of written documents using three different input methods. In the first task, students wrote by hand the text dictated to them by an adult. During the second task, the participants typed the text into the computer. For the third task, students dictated the text into the computer using a speech recognition program. Participants in the MacArthur and Cavalier (2004) study composed essays using the same three methods: handwriting, dictating to a scribe, and dictating to a speech recognition software program.

The accuracy performance of speech recognition programs has also been investigated. Coniam (1999) and Derwing et al. (2000) investigated the accuracy of speech recognition programs to recognize the dictation of users who spoke English as a second language. In both studies, the accuracy of the software program was higher for Native English speakers. Hux et al. (2000) examined the accuracy performance of three speech recognition programs used by two participants, one with and one without dysarthric speech. Thomas-Stonell et al. (1998) investigated the accuracy of the IBM VoiceType speech recognition software used by six dysarthria speakers and six nondysarthric speakers. The authors reported those speakers with intelligible speech achieved greater success. MacArthur and Cavalier (2004) investigated feasibility and

accuracy with students labeled with LD and non-disabled peers using Dragon NaturallySpeaking.

The majority of the studies reviewed here focused on academic skills (Elkind et al., 1996; Higgins & Raskind, 2000; MacArthur & Graham, 1987; O'Hare & McTear, 1999; Raskind & Higgins, 1999). What has not been addressed in previous research is that success in school also requires two other important skills, knowledge of how to study and how to take notes.

Results

The efficacy of speech recognition programs as an assistive technology tool for individuals with disabilities appears promising. The results to date have been positive for academic outcomes. Raskind and Higgins (1999) investigated reading and spelling performance. The participants used a speech recognition program to compose self-directed essays. Improved word recognition, spelling, and reading comprehension were noted for the participants in the experimental group (Raskind & Higgins, 1999; Higgins & Raskind, 2000).

Dictation has been noted as a faster process than writing or word processing for students with disabilities (MacArthur & Graham, 1987). In addition, fewer grammatical errors and improved writing was observed when stories were dictated.

Higgins and Raskind (1995) reported that speech recognition programs assisted students with learning disabilities in composing written text. Longer and improved compositions were observed when compared to handwritten essays. The programs

alleviated students' fears of spelling errors and messy handwriting. In turn, students used a larger vocabulary in their writing.

In addition to the encouraging research results, speech recognition programs have positive aspects, which make the programs attractive to users. The studies reviewed here indicated the positive attributes of speech recognition could be categorized into two groups: manipulation and independence, and writing.

Manipulation and independence. *Manipulation and independence* refer to the user having control of the computer. Users can control their computer with their voice to accomplish many tasks such as composing a document, surfing the Internet, emailing, and chatting on-line. These programs allow individuals with limited physical abilities an alternative input device, thus, creating less reliance on others (MacArthur, 1999). For instance, students who dictate into a tape recorder or directly to a third person can now type their paper through dictation.

Writing. Speech recognition programs have advantages for individuals with writing difficulties. De La Paz and Graham (1995) suggested that the quality of writing improves with dictation. Speech recognition programs may remove many of the barriers students face when writing. For example, dictation eliminates worrying about penmanship or typing. By eliminating the need to focus on penmanship or typing skills, students are able to focus on the content of the composition.

Dictation is also faster than typing or handwriting (Baber & Noyes, 1993; Graham, 1990; MacArthur, 1999; MacArthur & Graham, 1987). Lee, Hauptmann, and Rudnisky (1990) noted the number of words spoken per minute is approximately 200;

few people can type 60 words or more a minute. Students with learning disabilities have demonstrated the ability to dictate 40 to 70 words a minute using a speech recognition program (Raskind & Higgins, 1998). The students in O'Hare and McTear's (1999) study demonstrated dictation consumed half the time of typing. Dictation for these students varied from three to four minutes, while typing ranged from 10 to 41 minutes. The handwriting dictation activity was reported to take a total of only 17 minutes.

Speech recognition can also eliminate the fear of misspelling words, resulting in the use of a larger vocabulary, longer compositions, and improved written compositions (Graham, 1990; Higgins & Raskind, 1995; MacArthur & Graham, 1987). However, students still need to proofread. Substitutions, omissions, and insertions can occur during dictation. In addition, these programs are unable to distinguish between homonyms (e.g., two, to, too). O'Hare and McTear (1999) reported their participants' handwritten dictation contained spelling errors, and the mistakes identified in dictation to the voice recognition programs were due to misinterpretation by the program.

Another advantage of speech recognition programs is visual feedback. This allows the dictator to visually see their dictation. Dictation into a tape recorder does not provide visual feedback.

Limitations of Existing Research

The positive academic outcomes reported in the studies reviewed here are promising. However, Wetzel (1996) reported one unfavorable outcome regarding speech recognition as a tool for writing. After training sessions occurred, the program recognized only 74% of the student's utterances. The author attributed the extra sounds

the student made as a contributing factor to the low recognition rate. More than one participant needs to be assessed as the results may differ for other students.

Several other areas remain to be considered. One area is the usefulness of these programs over an extended period of time, such as months or years. In the studies reviewed, participants utilized speech recognition programs on a limited basis (Higgins & Raskind 1995; O'Hare & McTear, 1999; Wetzel, 1996). In the Higgins and Raskind (1995) study, participants received between five and ten hours of speech recognition training and used the program to compose one written essay. Participants in other studies have used speech recognition programs over the course of a few sessions. The participant in Wetzel (1996) study used the program during fourteen 30-minute sessions. Students in Raskind and Higgins' (1999) study used speech recognition programs for 50 minutes a week for a total of 16 weeks. The effect speech recognition programs might have on academic outcomes over the course of a school year or longer remains an area for further study.

The second area in need of investigation is the variety of uses for speech recognition programs. Utilization of speech recognition programs has centered on dictation of papers. Researchers need to investigate speech recognition programs as a tool for other writing purposes. Using the programs for activities such as surfing the Internet, dictating email messages, chatting on-line, or taking notes might promote life-long usage of speech recognition programs. To date, these areas have not been documented in detail. Roberts and Stodden (2005) investigated college students' use of speech recognition programs and discovered only one student used the program for

nonacademic activities. Further investigation of speech recognition software could suggest a link between recreational use, sustained academic growth, and long-term use.

A third topic in need of additional investigation is student perception.

Participants in Follansbee et al. (2000) study reported the task of correcting speech recognition errors as tedious and frustrating. The specific procedures that students used to correct errors were not specified (e.g., keyboard corrections, voice corrections, or a combination). Kotler and Tam (2002) explored the perceptions of participants who used discrete speech recognition software. Advantages and disadvantages were discussed; however, these may not be applicable to continuous speech programs. An adult male using a speech recognition program shared how the Dragon NaturallySpeaking program helped him, but information regarding his views of the program itself was not identified (Bruce et al., 2003). Recently, Roberts and Stodden (2005) investigated the usage of speech recognition programs by 15 postsecondary students with learning disabilities, the participants' writing performance, and factors impacting use and performance.

Participants who used and did not use the software were interviewed. Future research needs to clarify tasks users find difficult, as well as advantages and disadvantages of using both discrete and continuous speech recognition software programs, and how these programs are employed as a tool for writing.

Environmental factors also merit further scrutiny. Settings in which the speech recognition programs were used have not been adequately described in the literature. For example, O'Hare and McTear (1999) used a classroom as the location for their study. However, the presence or absence of other students and their activities remain unknown.

Higgins and Raskind (1995) used speech recognition software with postsecondary students, but it is unclear if use of the program occurred in an office, residence hall, library, or computer lab. Setting characteristics, such as noise, presence of others, and the impact of speech recognition on others may seriously affect the overall efficacy of speech recognition programs.

Kotler and Tam (2002) and Bruce et al. (2003) investigated speech recognition programs used by participants in their homes. The authors did not report characteristics of these settings. A computer's location, presence or non-presence of others when the program was utilized, and the noise levels are factors that may contribute to program's performance and the consumer's use of the program. These factors remain to be described in the research.

A fifth area for further research is technology abandonment. An estimated one-third of purchased assistive technology tools for individuals with disabilities are abandoned (Todis, 1996). Numerous factors contributing to abandonment have been identified, and include the following reasons:

1. Cost - Cost contributes to abandonment of assistive technology (Alper & Raharinirina, in press; Scherer, 1993; Wehmeyer, 1999). Lack of financial resources makes equipment unobtainable too many. In addition, maintaining and repairing equipment may be difficult.
2. Paperwork - Paperwork can be tedious. The administrative bureaucracy that mandates the process for individuals with disabilities to receive and maintain

appropriate equipment and technology often discourages eligible candidates because of an undue amount of paperwork.

3. Lack of technical support - Lacking technical support (Lode, 1992) can also lead to abandonment of technology. Not having a resource person to contact for problems with the assistive devices often leads to the equipment sitting idle. Scherer (1993) identified unreliable technology and on-going support as a contributing factor of abandonment.
4. Negative attention - Todis (1996) identified negative attention to equipment contributing to abandonment. Users of assistive technology may feel self-conscious about using their equipment in public. Voice recognition programs require users to be vocal in their environment. This may draw negative attention from others or discourage them from sharing their environment.
5. Complicated design - Complicated design factors may also result in discontinued use of equipment (Scherer, 1993). Often, users are unable to set up the equipment, learn how to use it, and became frustrated (Scherer, 1993). Batavia, Dillard, and Phillips (1990) conducted telephone interviews with consumers of assistive technology. In their study, the clients quit using the equipment because they had difficulty using it independently. High-tech assistive technology, which requires a lot of time and effort for learners may be abandoned.
6. Lack of choice - Users may also stop using the speech recognition program because they were not involved in decisions regarding the selection of the

equipment (Alper & Raharinirina, in press; Parette, 1997). Too often the individual requiring a piece of assistive technology will not be provided with an opportunity to state what piece of equipment would be the most beneficial, practical, or desirable.

Inconsideration for the individual and family's needs is prevalent (Parette, 1997). Often recommendations are made without taking into account the lifestyle and preferences of the individual and his or her family.

McGrath, Goodman, Cunningham, MacDonald, Nichols, and Unruh (1985) examined the utilization of assistive devices, satisfaction, and the children's perceived importance of the equipment. Five hundred two families who had received financial assistance from The Assistive Device Program in purchasing various assistive devices participated in telephone surveys. The program paid 75% of the equipment cost, which included various pieces to assist with mobility (e.g., wheelchairs), communication (e.g., hearing aids), life support equipment (e.g., respiratory equipment), and corrective positioning (e.g., braces, splints). Devices for communication, mobility, and health purposes were used, while the equipment perceived as either inconvenient or not socially acceptable remained unused.

Scherer (1988) studied the utilization of assistive devices by five adults with cerebral palsy and five with spinal cord injuries. Factors associated with the user's utilization or non-utilization of technology and their perceptions of how the devices affected their quality of life were investigated. Those adults who utilized their assistive devices focused on their new-found abilities as a result of the technology. Their self-

motivation and desire for independence were two attributes of their use. The nonusers perceived the following obstacles they faced, as a result of their limited ability, they could not overcome and contributed to their limited use: cost of equipment, stigmatization, and lack of support from family.

Goette (2000) interviewed 23 successful and 17 unsuccessful adult users of speech recognition programs identified with physical limitations such as arthritis, muscular dystrophy, and cerebral palsy. Factors distinguishing the users from the nonusers were the training provided, environment, individual's disability, and the compatibility of the task with the software.

Blackstone (1992a) stressed abandonment and indicated the importance of professionals being aware of the users' needs and preferences. She also favored using the term *consumer*. This word confers an active role regarding the selection of assistive technology instead of a passive role, with terms like *client*, *user*, or *patient*.

The term consumer acknowledges upfront that the personal needs, preferences, idiosyncrasies, style and resources of people who benefit from assistive technology (i.e., individuals with problems and their families) have a direct and unequivocal impact on whether and how devices are used. To successfully transfer technology into use, it is necessary to recognize and build on the expertise of the consumer as his/her own long-term "technologist." (p. 1)

Abandonment is directly related to a lack of value for the consumer's input (Blackstone, 1992a, 1992b). To combat abandonment and obtain the full benefits of assistive technology devices, users and their families need to become informed individuals and allowed to express their own needs and preferences.

Scherer (1991) has designed the Matching Person and Technology (MPT) Model (Appendix A) to decrease technology abandonment. The MPT was designed to assist in

matching the consumer with technology and in reducing abandonment of a technology purchase. Using the model to identify factors influencing the use of assistive technology can assist in identifying the applied interventions that may be needed to increase the users' potential for use. The model identifies two levels of use—optimal and partial/reluctant—and two levels of nonuse—avoidance and abandonment.

The three components in the MPT model to consider when matching technology to an individual are milieu, person, and technology. Milieu refers to the environment, specifically, the characteristics of the setting where the technology device will be used. Important influences within the consumer's environment are: (a) the user's support system, such as, family members, friends, or employer; (b) expectations of those individuals within the user's environment (i.e., realistic, unrealistic); and (c) the environment for the technology.

The second area Scherer identified was the individual's characteristics and preferences. This includes the user's feelings toward using the assistive technology (i.e., proud, embarrassed), motivation level, patience level, and the user's skill level for utilizing the device.

The final area for evaluation is the usefulness of assistive technology. Factors considered include: amount of physical pain users receive from using the equipment, the compatibility of the device with other technology equipment, the user's accessibility, ease of the device (i.e., safe, easy to use and maintain, reliable), and availability of other options to the consumer.

Along with the model, Scherer has designed assessments to assist in the identification of appropriate assistive technology tools. These resources consist of data gathering checklists completed through observation and interviews for the purpose of being used to inform and indicate areas that may require further assessment prior to an assistive technology selection.

Summary

To date, the available research indicates a consensus that speech recognition programs have positive outcomes. Nonetheless, unexplored issues remain. Specifically, distracting variables, such as noise or the presence of other people within the users' environments, have not been taken into account. In addition, investigation of other practical uses for speech recognition programs and maintenance of use remain areas for further exploration.

Students' perspectives are found to be lacking in the existing research on speech recognition. Although comments, reactions, perceptions, and opinions of professionals using speech recognition for the purpose of evaluation or promotion of the product can be obtained through the Internet, research focused on perspectives and experiences of users of assistive technology remain very limited.

In the first section of the literature review, a brief introduction to speech recognition programs was provided. Definitions and various types of programs were described. Next, studies utilizing speech recognition programs were discussed in reference to the participants, independent and dependent variables, and results. A discussion of the limitations within the existing research concluded this chapter.

CHAPTER 3

METHODOLOGY

I explored the perspectives of college students with learning challenges about speech recognition software. Using qualitative research methodology, I investigated the speech recognition training process, use of the programs over a period of time, positive and negative factors within the environment, and users' perceptions of the software programs.

Five students were observed and interviewed during two semesters of their postsecondary education. The cases provided a deeper understanding of how speech recognition programs can be used by students attending various postsecondary institutions and living in diverse residential environments.

Qualitative research is interpretive. The researcher's judgments, values, and biases are explicit in the research report. Qualitative research involves fieldwork, including observing or recording behaviors in a natural setting (Merriam, 1998). Therefore, environmental observations were included to provide insight into participants' behaviors. Interviews added further understanding and depth of interactions that occurred between researcher and participants.

Study Characteristics

Research is an examination, study, or investigation with concern for evidence and theory (Gillham, 2000). The way in which problems are approached and answers sought is referred to as methodology (Taylor & Bogdan, 1984). The methodology of qualitative research is used to understand a social phenomenon in its natural setting and "the

meaning people have constructed” (Merriam, 1998, p. 7). By talking with and interacting with participants in the field, the researcher gains a fuller understanding of what happens and how participants perceive what occurs (Bogdan & Biklen, 1998; McMillan, 1996). Therefore, the researcher has involvement with the phenomena being studied (Gall, Borg, & Gall, 1996) and is “the primary instrument for data collection and analysis” (Merriam, 1998, p. 7). The result is a “complete, literal description of the incident or entity being investigated,” also called thick description (Merriam, 1998, p. 29-30). The researcher uses inductive data analysis to “build abstractions, concepts, hypothesis, or theories” (Merriam, 1998, p. 7), allowing the reader to determine the validity of the information.

Qualitative research methods are also appropriate when there is a need to:

1. Carry out an investigation where other methods, such as experiments, are either not practical or ethically justifiable;
2. Investigate situations where less is known about what exists or what is occurring;
3. Explore complexities that are beyond the scope of more controlled approaches;
4. Get “under the skin” of a group or organization to find out what really happens, the informal reality, which can only be perceived from the inside;
5. View the case from the inside out and see it from the perspective of those involved; and,

6. Carry out research into the process of leading to results (for example, how reading standards were improved in a school), rather than into the “significance” of the results themselves (Gillham, 2000, p. 11).

In this chapter the research approach used to carry out this study is described.

The methodology is divided into four main sections: (a) participants, (b) methods and procedures, (c) analysis of case studies, and (d) data collection and trustworthiness of the data. The following preliminary research questions were used to provide a focus for inquiry:

1. How do students who have learning challenges experience the training process of their speech recognition program?
2. How do students who have learning challenges utilize speech recognition programs for college academic demands over an extended period of time after training is completed?
3. What are the positive and negative factors that affect how students use speech recognition programs?
4. In what ways do students benefit from these programs as judged by their self-perception and by analysis of their writing samples?

Participants

This study drew upon interactions with and observations of five college students with learning challenges. Students were selected based on two criteria: (a) each student had a learning challenge and (b) each was enrolled in a postsecondary institution. It was

not my intent to identify a random sample. Rather, I selected a few students who met the criteria and agreed to provide their perspectives.

Prior to the fall semester, participants received a letter explaining the researcher's intent. Students were asked for their participation and provided with an explanation of their rights as participants. A signed informed consent form was obtained from the student if he/she agreed to participate (Appendix B).

The participants selected for this study were: (a) both male and female students, (b) Caucasian, African-American, and bi-racial individuals, (c) students with physical and/or academic challenges, (d) students either residing at home with their families or living in residence halls or apartments, and (e) participants attending either a community college, comprehensive university, or private liberal arts college. All three higher education institutions were located in the Midwest. Surrounded by rolling farm fields, the community college had an approximate enrollment of 4,000 students with 42 different programs offered through day, weekend, and evening classes. The mid-sized comprehensive university, located in an adjacent town to the community college had over 14,000 students. The private liberal arts college was located in a small Midwest town in the northeast section of the state and over 5,000 students enrolled through on-campus and/or center-located classes.

All the participants selected were served by a federally funded project. They were identified as individuals who had an academic need that could be met with a speech recognition program. Students received equipment, training, and technical assistance as needed to assist them in meeting their academic goals. Participants in the study were

encouraged to contact me when they encountered difficulty. To protect the identity of participants, each was assigned a pseudonym. A brief description of each of the five students follows.

Case Study 1: Harvey

Harvey was 19-years-old at the beginning of the study and of Caucasian descent. He maintained the appearance of an adolescent and stood at an approximate height of five-foot and eight inches. When asked to describe himself, he hesitated. When provided with a few adjectives and phrases, such as jokester, likes to have fun, and laid-back, he agreed. He added he viewed himself as a kind person.

Residing at home with his parents, an older brother, and a dog, Harvey lived within walking distance of a state university. His father worked second shift at a local factory. His mother was self-employed and still very involved in Harvey's academic affairs. Harvey's brother completed his undergraduate work at the local university during the fall semester of 2003 and applied for graduate school in the field of dentistry.

Harvey was an avid outdoorsman, engaging in hunting and fishing. This could be witnessed in his bedroom that was decorated with mounted fish and deer heads. As a result of these interests, Harvey selected the Natural Resources Management program as his field of study at the local community college. He aspired to be employed by his state's Department of Natural Resources (DNR). In the second year of his educational program, Harvey predicted it would take him four to six years to complete his degree. He continued to struggle with his academics; in spite of this, he stated he would stay with the program for "however long it takes." To Harvey, being able to "give tickets for

poaching, hunting, fishing, and . . . speeding on the highway” added to the appeal of becoming a DNR officer.

Located on the second floor of a two-story home were the family members’ bedrooms. It was apparent from the decor of Harvey’s bedroom that his interests and hobbies revolved around hunting and fishing. Within his room was his IBM-compatible computer on a desk along with his stereo. A computer was also located in the basement family room.

Throughout Harvey’s educational years, he received special education services. He recalled being pulled out of the classroom to receive extra help with reading during his elementary years. During high school, academic accommodations, such as extra time for tests, were provided. His special education teacher recommended the use of a speech recognition program to improve his writing due to his poor spelling and writing skills.

Harvey’s computer skills included being able to load software, disconnect and reconnect his computer, and use MSWord for word processing and MSPower Point. He also acknowledged he could use email and instant messenger. Harvey described his computer skills by stating, “I don’t know as much as some at school, but I do know more than others.” During another conversation he stated, “I know more about the computers than you do.” Through observations and discussion, it became apparent Harvey’s level of computer skills allowed him to meet academic demands and engage in activities of his choice, such as chatting on-line. He explained how he found a picture of a buck on the Internet and downloaded it to his computer.

When asked to describe a typical day, Harvey recalled getting out of bed around 6:30 a.m. and then going to school. After classes, he either slept or went hunting or fishing with friends. He worked in the kitchen of a local restaurant on weekends and evenings.

Case Study 2: Mae

Mae was a 19-year-old African-American female beginning her second year of postsecondary education at the local community college. Being blunt and honest, Mae described herself as an individual who was “nice, cool, and laid back.” She mentioned feisty and not having patience as two additional characteristics. Mae described her physical attributes as being “cute.” She continued describing herself as “short; five two, five three” and concluded by saying, “I have hips.”

Mae resided with her mother, grandmother, and two older brothers. After Mae graduated from high school, in the spring of 2002, and her mother completed her college degree, they moved in with Mae’s grandmother who required home care. During the 2004 spring semester, changes within the family occurred when a brother moved out of state and one of Mae’s aunts stayed at the house for a length of time to assist with the grandmother’s failing health.

Mae described her family’s life as busy. One of her older brothers who was in the room during the interview added, “It is a work-a-holic family.” Mae agreed everyone in the family worked, except for their grandmother. She acknowledged that her mother’s busy schedule consisted of working fulltime at the local university as an administrative assistant and also part time at a local department store. Mae’s two brothers were both

employed and Mae worked part time at a local department store, averaging 20 hours a week. In addition to working outside of the home, family members took care of Mae's grandmother who required 24-hour care, continuous supervision, and assistance with self-care skills such as bathing, dressing, and meal preparation.

Mae aspired to graduate in May 2004, with an Associate Arts Degree as an Office Specialist. When probed about her career plans, Mae hesitated. Undecided on her plans at that moment, she stated that after graduation she might work in her degree field for a year before pursuing a nursing degree. Another career choice, journalism, surfaced during the conversation. Other career possibilities emerged throughout the year as she identified interior design as an additional area of interest.

Located in the basement family room, a computer was available for all family members. When asked how family members utilized the computer, Mae said everyone used the computer for communication purposes, specifically email. The Internet was identified as a leisure activity as well as a source for information (e.g., finding additional information regarding an illness), and as a tool for shopping on-line. Mae replied that she also relied on the computer for academic purposes.

Space appeared to be limited. In addition to serving as an entertainment and computer room, the basement also served as a bedroom for one of Mae's brothers. Background noise was a part of the environment, as Mae identified that she did not like it quiet; therefore, she left the television on for background noise.

Mae received special educational services in high school. During this time, she received extended time for testing as an academic accommodation. Mae stated during

high school she did not ask for assistance; consequently, she did poorly. She acknowledged that she was now better at seeking assistance. Her high school special education teacher recommended using a speech recognition program.

Mae confidently said she had a lot of computer experience. “I think I am a pro when it comes to computers. I think I am. I can say that.” When questioned about her typing speed, she explained that she was a fast typist and could produce approximately 60 words a minute. She also noted her efficiency with the Internet. Mae’s computer abilities included using email, searching the Internet, composing documents in MSWord, and connecting the Internet, hub, and printer to the computer.

Case Study 3: Mark

Mark was an 18-year-old athletic, bi-racial male on the verge of independence. With short black hair, he stood approximately 5’10”. When asked to describe himself, Mark said, “outgoing and funny.” He smiled and added, “I always have a tan.” Mark demonstrated respect for others during both social and formal situations by being prompt to appointments and using etiquette during conversations. He was also very generous and willing to give up his time to assist others.

Prior to the fall semester, Mark lived at home with his mother and younger sister. His mother was working and completing her bachelor’s degree in education. During the summer prior to his freshman year, Mark completed two classes at the local community college. When asked why he enrolled in two classes, Mark replied, “To get ahead . . . so it wouldn’t take as long.”

In the fall, Mark moved into a college residence hall at the private college located less than two hours from his hometown. This proximity allowed for trips home on the weekends to see his family and girlfriend. Not assigned a roommate, Mark had a room to himself. However, he could have had a roommate assigned to him at anytime. A cinder-block dorm room--which he referred to as a "jail cell," Mark's space consisted of the traditional items: two twin beds, two dressers, two desks, and two moveable closets. With all his belongings placed along the walls of his room, the center area of his room remained open. In one corner of the room, the two twin beds were placed next to each other, as if they were actually a queen-size bed. His stereo system and television sat on his two dressers at the foot of his bed. The two desks were placed side by side in the corner diagonal from the bed. The computer sat on one of the two desks. In addition to the traditional college items, Mark had photographs of his girlfriend on his desk and dresser, as well as her class and work schedules posted.

Mark played for his high school football team and continued playing football as a wide receiver on the college Junior Varsity team. When not consumed with football practice and schoolwork, Mark filled his free time playing intramural sports and spending time with friends. Mark also enjoyed working on cars.

Undecided about a major when classes began, Mark identified mechanics and computer science as two areas of interest. At the end of his freshman year of college, Mark remained undeclared and had added the area of sports medicine as a possible career option.

Mark attended a college with academic quarters. The year was divided into four eight-week quarters rather than two semesters. Students took two or three classes, the equivalent to six or nine credit hours per quarter. This feature attracted Mark to the private liberal arts college. He explained he felt he would do better academically having only two classes a quarter to concentrate on rather than four classes a semester. He explained further by stating, "I will be able to study." He felt he would not have enough time to study if he had four or more classes and football practice and games to attend.

Mark identified his computer abilities to include connecting and disconnecting hardware components of a computer, loading software, accessing the Internet and email, and, of course, communicating through instant messaging. He was willing to learn and install new hardware; he discussed his experience trying to get a scanner to work properly.

Case Study 4: Renee

Renee was a 20-year-old Caucasian college student with long blond hair. She spoke with a soft voice. While quiet, but not shy, Renee maintained a poised presence and a welcoming smile. She described herself as an individual of average height and "nice appearance." She added she was a good listener, active, and quiet until she knew the person.

Living in a middle-class neighborhood on a quiet street lined with trees, Renee resided with her parents, her younger brother, and their two house cats. Her father, whom Renee referred to as "very smart," had received several patents and now was a

retired engineer from a farm equipment manufacturing company. Her mother taught in the classroom prior to retiring in 2003.

Renee was enrolled at the local community college and completing her second year. Majoring in child development, her plans after graduation were to work in a daycare center or to continue her education at the local state university. In addition to school, Renee maintained part-time employment at a retail salon store averaging 10 to 20 hours a week.

Within the home, the computer was located in a room that typically would be considered the dining room; however, the room lacked a dining table. The open layout of the home allowed for a centrally located computer accessible by all family members. Renee and her brother were the primary users, in addition to their friends who would use it from time to time. Renee's parents had limited use of the computer. Renee attributed her mother's limited use to fear of breaking the computer or doing something wrong.

Renee stated she received special education services throughout high school. She recalled being identified before the end of eighth grade as having learning disabilities. Renee believed two factors were used to identify her as learning disabled. First, she stated she did not interact with her peers because of being "picked on a lot." The second factor was probably her poor academic performance. Renee acknowledged that at the time she was diagnosed, she did not care about school or put forth much effort academically. Her lack of enthusiasm came from confrontations at school; at that time, she didn't want to attend school.

During her high school years at a public school, Renee received special education services. Accommodations provided included extended time and material/text read to her or made available on tape. She admitted to liking the extra help. However, she felt having the label of “learning disabled” resulted in her not pushing herself; she became accustomed to adults believing she would struggle. Adults did not challenge her, so she did not challenge herself. Renee recalled her special education team discouraging her from taking a particular math course. They encouraged her to take the course the following year, which would have resulted in her graduating later and not with her class. Renee did not like this suggestion, and despite the team’s lack of confidence in her abilities, she enrolled in and completed the course.

Renee was quite comfortable accessing and using MSWord on the computer. During training, Renee connected her computer tower to a computer monitor for the first time, while I provided her with verbal prompts. A few weeks later, when she received her computer, she independently connected her monitor, printer, and scanner to the computer tower.

Case Study 5: Travis

Travis, a Caucasian male in his late twenties, 28, was in his senior year of college at a comprehensive state university. Travis had blonde hair, blue eyes, and a height of approximately 5’7”. When asked, he described himself as “honest and open, a good listener, very loving,” and as an individual who worried about others before himself. He also noted bluntness as a character trait.

Outside of school, Travis's activities included spending time with friends, participating in intervarsity sports, and activities such as Bible study and prayer group. His behaviors suggested an outgoing personality, as he often could be found in non-academic social settings and visiting with friends in person or on the telephone. Travis enjoyed playing video games and watching sports on television during the day. During conversations, Travis mentioned that he was a Christian and the importance of his faith. This was further evidenced by his cell voice mail message ending with "God Bless."

Travis has had Cerebral Palsy since birth. He relied on a wheelchair for traveling long distances and crutches for short trips. He explained he had a seizure as a young child, was diagnosed with arthritis, had carpal tunnel syndrome in his wrists, and needed reconstruction of both knees.

Travis was older than the other students in the residential hall where he resided during the spring semester of the academic school year. He classified himself as a non-traditional student because he did not display the typical college behaviors; he considered himself wiser and more mature than the typical college student. Although Travis was older than his peers, he maintained the traditional roles of eighteen-to-twenty-two-year olds, going to school and caring for oneself with no additional responsibilities. Travis's full-time job consisted of school and budgeting his time.

Travis had been in postsecondary settings for ten years and moved to various states and attended different universities. While at the local university where this study was conducted, Travis resided with a male roommate in a two-bedroom university apartment. The computer was located in the living room. He continued to live in the

university apartment during the summer and fall semesters of 2003. Due to financial constraints, Travis moved into one of the residential halls for the spring 2004 semester. Living in a residence hall once again, Travis had a room to himself. His room consisted of a sink and two closets on one wall with a window on the adjacent wall looking out to university apartments. Carpet covered two of the four walls with the outside wall consisting of brick. At the end of the spring semester, Travis moved out of the residence hall and into an off-campus apartment with two other roommates for the summer. Within his room Travis had all his belongings, refrigerator, recliner chair, computer, bed, stereo equipment, and television.

Majoring in history with a minor in political science, Travis had aspirations of becoming a university professor. At the comprehensive university he attended, Travis was eligible and received accommodations that allowed him access to both academic and non-academic programs. Travis reported receiving accommodations such as books on tape, priority registration, separate location and extended time for completion of exams. Identifying note taking as an area of difficulty, Travis stated, "Note-taking in class is basically non-existent." A writing sample he provided supported his description of his illegible penmanship. He explained that he was only able to engage in fine motor activities for short durations.

Due to Travis's limited mobility, he had received academic accommodations throughout his school years. He recalled computers always being a part of his life as a tool for meeting academic requirements. His computer experiences included school and leisure-related activities, such as using the Internet to research information, utilizing

writing programs for school requirements, and downloading songs onto his computer for pleasure. Before having a personal computer in his room, Travis completed papers at the university computer labs or dictated to friends while they typed his papers.

Travis reported having experience with various technology tools. He stated that he had been “a guinea pig” for Dragon Dictate while enrolled at a university in the northwestern United States, prior to his enrollment at his current university. He expressed over the year his preference for IBM compatible computers. He discussed the difficulty he encountered when a problem occurred, and he tried to correct it; for example, if the microphone was not working properly. Travis shared his frustration as he noted that with Macs he had to open multiple windows. He said, “I don’t know the logistics of a mac. . . I was brought up on a PCs.”

Travis identified having numerous songs on his computer. He said it was easier than getting the CD out of its case and placing it into the CD player. He stated he did not play games on his computer because he had a Play Station. Completing papers and surfing the Internet were two activities he identified as tasks he completed using his computer. Travis demonstrated a few basic word processing skills of programs such as opening and producing a document. Other skills, such as creating folders, using tools in the toolbar, and saving documents in particular locations were taught throughout the year.

Using the computer for email remained limited. Accessing his university email, Travis expressed, was an activity he found frustrating because of the security and having to remember a password. He let it be known he did not use his email because he did not commit to memory his password. As a result he had not checked his email in over a year.

He expressed his feelings that students only have email because “teachers are too lazy to make paper assignments (laughs). Let’s put it on the email and if they miss and they can’t get it, oh, we will blame them.” Continuing with his thoughts he acknowledged he needed to use his email as departments on campus increased their use of email. Some knowledge of email was demonstrated as this mode of communication was used a few times during the early spring semester when he had established an account with one of the email service providers. His preferred mode of communication was telephone, specifically his cell phone, which he instructed me to use to reach him.

Prior to this study, Travis had a history of receiving “incompletes” for classes. There was hope the speech recognition software would alleviate these incomplete grades. However, Travis continued to receive incompletes for each semester of this study. He reported incompletes were generally the result of late notification from professors, resulting in insufficient time to complete assignments. For example, Travis reported that a few days prior to the final examination for one class, the professor informed him the paper had to be typed, not recorded on an audio-tape.

Sites

Interview and observational sites varied. Training sessions for three of the participants occurred at the local university in a private office. The participants’ residences were used also. Interviews occurred within participants’ residences that included a residence hall, apartment, and a family unit. Within the home, interviews and observations occurred in dining rooms, living rooms, and a bedroom.

Equipment

Upon enrollment in the federally funded project, participants were provided their choice of an IBM compatible or Macintosh. Two of the participants received a Gateway computer, one received a Dell, and iMacs were provided for the remaining two participants. The IBM-compatible computer users received training on the DNS speech recognition software (Version 7 Preferred). One of the participants using an iMac was provided the ViaVoice OSX speech recognition program, while the other iMac user received the program iListen.

All three programs had similar features that allowed for dictation, editing, opening and launching programs, and formatting documents. In addition, the programs were capable of surfing the Internet and using email. The software also interfaced with other word processing documents such as MSWord, Corel WordPerfect, and AppleWorks. Playback of dictation and read back of typed documents were additional features of these programs.

Methods and Procedures

Methods used in this study allowed for data to be collected that answered questions not previously investigated. A qualitative approach was implemented. Multiple data collection procedures were used to ascertain college students' viewpoints of speech recognition programs. This study offers interpretation to the research on speech recognition, generally investigated from the quantitative paradigm.

The goals of this study were to: (a) understand the speech recognition training process experienced by students, (b) understand how students utilized the speech

recognition software, (c) understand factors that affect student use of the program, and (d) benefits of using speech recognition software. The questions centered not on what the programs were designed to do, but on how students accomplished academic demands. In order to investigate use of speech recognition software and answer these questions, the appropriate methodology was qualitative because it allows for observations of interactions between individuals and their environment. In this study, the interaction between the speech recognition software program and the participant was observed. An examination of speech recognition programs through a qualitative methodology provided insight into the students' feelings, perceptions, use, and understanding of speech recognition programs. Observations and answers of this variety could not be obtained through a quantifiable approach.

A case study approach was utilized to understand college students' perceptions of use of speech recognition programs over the course of an extended time period. A case study is a qualitative approach that looks closely at a few cases. This approach allows the researcher to study a problem, situation, or a group of people in great depth (Patton, 1990). One of the strengths of performing a case study is providing an "interpretive account of the way participants make meaning" (Manning, 1992, p. 45). In this research, case studies examined five college students with learning challenges while they were trained and used speech recognition programs.

Analysis of the Case Studies

Analyzing qualitative data is a process of gathering the data, organizing the concepts, synthesizing them and discovering what is important, what is learned, and what

is important to share (Bogdan & Biklen, 1998). As Patton (1990) noted, the case study approach collects, organizes, and analyzes data for the purpose of gathering comprehensive, systematic, and in-depth information. The stories that follow were synthesized after an ongoing analysis occurred between each interview. Constructing the five cases in this research involved collecting the information, analyzing the data for a case record, and writing a descriptive narrative (Patton, 1990).

Data analysis continued throughout the project. Questioning and interviewing participants revealed unforeseen leads that were relevant to data collection. In a personal journal, self-reflections and questions of the researcher were recorded. Interviews, observations, observational notes, and taped sessions were analyzed to seek a deeper understanding.

Data Collection and Procedures

Data were collected over the course of two semesters beginning in August 2003 and ending in August 2004 for all of the participants. Several data sources were used to answer the research questions. Data sources included: (a) observations, (b) interviews, (c) stimulated recall, (d) document analysis, (e) Matching Person and Technology Model, and (f) reflective notes. The data sources used are identified in Figure 1.

Observations. Observations may be categorized as participant or non-participant. In this study, I was a participant; I trained and interacted with the five students during the year. As an observer, I noted students' behaviors and interactions with their speech recognition program during the training sessions. Observations of students dictating course assignments were limited, as it was intended to allow students to use their

programs at their discretion and without pressure. During training sessions and interviews, observations were written and kept as field notes. Taped training sessions and interviews were reviewed for behaviors and reoccurring themes.

Interviews. Understanding what is happening and how people perceive what is occurring requires the researcher to go to participants in the field (Bogdan & Biklen, 1998; McMillan, 1996). Therefore, the researcher is involved with the phenomena being studied (Gall, Borg, & Gall, 1996) and is “the primary instrument for data collection and analysis” (Merriam, 1998, p. 7). As the researcher, I was the main instrument; I assumed the role of an interviewer, and I observed, questioned, and interacted with the participants in person, through email communication, and telephone conversations.

Over the course of the two semesters, I used an exploratory and semi-structured approach in the interviews. The first two interviews were focused on pre-training (Appendix C) and post-training (Appendix D) and occurred during the first and last training sessions. The purpose of the pre-training interviews was to identify the students’ familiarity with computers, areas of academic difficulty, and their expected outcomes of the speech recognition software. During the post-training interviews, students were interviewed regarding their perceptions of training they received, the training process, and the requirements of learning the commands that allow maneuvering within a word document.

After training concluded, follow-up interviews were conducted throughout the year. During these interviews, students were asked if they had used the program, why or why not, what difficulties or problems they encountered, and their reactions to using the

program (Appendix E). At the end of the spring semester of 2004, a final exit interview (Appendix F) was conducted to discuss the students' experience with and perspectives on speech recognition programs as an assistive tool. Detailed notes on each training session were kept, along with notes describing each visit, student's interactions, and behavior while using the program. In addition, all phone contacts and email messages were logged.

After each interview, I transcribed the tape and had it reviewed by a second observer for missed content. Then I reviewed the transcribed tape a second time to confirm or disaffirm identified information by the second reviewer. During this process, additional comments were noted directly on the transcriptions. The raw data were examined for emerging themes and behaviors.

Stimulated recall. Stimulated recall is a self-reporting technique described by Bloom (1953) as a procedure with the basic premise "that a subject may be enabled to relive an original situation with great vividness and accuracy if he is presented with a large number of the cues or stimuli which occurred during the original situation" (p. 25). This technique is accomplished by providing cues or stimuli (i.e., audio, video) that will allow the individual to recall their thought process during the original situation. As the cues are provided, the participant can self-reflect and provide comments on their thoughts he or she was having at the time of their behavior. This technique is appropriate when asking an individual to think aloud would disrupt the task being completed (Marland, 1984), as in this research. Asking participants to reflect on their feelings and thoughts while dictating would interfere with the program and their thought process.

Calderhead (1981) identified concerns with stimulated recall as a method for teachers to recall their teaching behaviors. These concerns are valid for using stimulated recall with any participant. First, several factors (e.g., anxiety) exist that influence the extent an individual recalls or “reports their thoughts” (p. 213). Second, one’s awareness and verbalizations are less controlled. Third, the preparation and instructions provided to participants may vary and influence teacher’s actions. To combat these concerns, I served as a facilitator and asked open-ended questions.

Originally, Bloom (1953) used audio recorders. In this study, a video camera was used to capture the participants’ behaviors. During the next appointment, portions of the previous session were viewed (i.e., viewed reading of one story). The participant and I had the opportunity to stop the video at any point for discussion. Marland (1984) noted an interviewer is usually involved as a facilitator. I served in the role of a facilitator as I asked open-ended questions. Each of the viewing sessions were videotaped and transcribed.

Document analysis. A rubric is an assessment tool to measure student achievement and proficiency level (Montgomery, 2001). A writing rubric was designed to evaluate, assess, and record any changes occurring in the dictated writing samples of the students during the course of two semesters (Appendix G). Students’ dictated assignments were compiled and examined by an outside evaluator and myself. The rubric evaluated writing samples on five categories: organization, sentence structure, vocabulary, spelling and grammar, and punctuation. A score of zero to three points could be earned for each category for a maximum of 15 points for each sample.

Over the course of the two semesters, assignments were collected from the participants. Writing samples from Mae were unobtainable because she did not complete the required training. Two writing assignments were obtained from Harvey. Several assignments were collected from Mark. This included five question-and-answer assignments and four written essay papers. An assignment Mark completed for his girlfriend, consisting of his reactions and comments to statements, was acquired. A collection of poems Mark read into the computer was not received. Renee provided one assignment and Travis four. Other written materials were collected during the year, for instance, all emails and practice dictation occurring during training and appointments.

Matching person and technology model. The MPT model was used to identify on the continuum the degree to which participants used their speech recognition program. The model was also used to better understand what factors may have influenced use or lack of use of the program. Data collected through observations and interviews were plotted on the model to assist in the identification of contributing factors after students received and used their assistive technology.

Reflective notes. Reflective notes were kept of each training session, home observation period, face-to-face contact, phone conversation, and documents obtained. Descriptions of the students' interactions, behavior, and their understanding, as well as my interpretations, were gathered in these reflective notes. Written documents dictated by students were kept for further analysis of students' progress.

A total of 55.1 hours was spent with the five participants. Total contact time with Mae consisted of 3.6 hours. The incomplete training process explains these few hours.

Contact hours for the remaining participants were 7.4 hours for Renee, 9.9 hours for Harvey, 12.9 hours for Mark, and 21.3 hours for Travis. Training consisted of 23 hours and ranged from 2.4 to 7.2 hours per student. Follow-up sessions, consisting of observations and interview questions, consumed 32.1 hours. Again, these hours varied for each participant, between 1.2 hours and 16.1 hours.

Trustworthiness of Research Data

Lincoln and Guba (1985) demonstrated the four constructs used in quantitative research, that is, internal and external validity, reliability, and objectivity, to validate the findings are inappropriate for qualitative investigations. They identified four constructs that are appropriate: credibility, transferability, dependability, and conformability. Credibility demonstrates that the research was conducted in a manner that was described and identified accurately. Transferability refers to the results of the study being generalized to other contexts or settings. In qualitative research, the reader has to decide if the material is transferable. Lincoln and Guba (1985) stated, "It is *not* the naturalist's task to provide an *index* of transferability, but it *is* his or her responsibility to provide the *data base* that makes transferability judgments possible on the part of potential appliers" (p. 316). Dependability refers to accounting for changes that occur in the study as a result of an understanding being acquired. The final construct, conformability, refers to the objectivity and neutrality of the data (i.e., the research is free of research bias).

Establishment of trustworthiness and credibility can be accomplished through several different measures. Procedures implemented in this study are described:

1. Prolonged engagement—gathering data over an extended amount of time in the field and allowing for ample time to learn the culture, build rapport and trust, and overcome personal barriers (Lincoln & Guba, 1985). In this study, I gathered data over the course of two semesters for a total of 55.1 hours engaged with the participants in training and follow-up sessions for the purpose of interviewing.
2. Triangulation—multiple data collections used for analysis (Lincoln & Guba, 1985). Interviews, observations, and artifacts (e.g., papers, assignments) were collected.
3. Clarification of researcher bias—the researcher identifies his or her assumptions and biases for the reader to allow understanding of the researcher’s position (Merriam, 1998).
4. Member checking—allowing the participants the opportunity to review data collected to ensure accurate representation of them and their ideas (Lincoln & Guba, 1985). To ensure accurate representation and understanding of their comments, participants were asked to read written material, specifically the description of themselves and the explanation of the fall and spring semesters. Four of the five participants replied. Through either written comments or face-to-face conversation, students clarified and added information and/or approved of the written material. I met with participants who had additional information and accepted written comments, corrections, and clarification of

information. Written notes were taken and additional information and corrections were made.

5. Rich, thick description—writing that is descriptive and detailed enough to recreate the situation to allow the reader to understand the results of the study (Lincoln & Guba, 1985).
6. Persistent-observation—data collected over an extended period of time through repeated observations (Lincoln & Guba, 1985). In this study, I interviewed students, collected dictated material, and observed.

Summary

Qualitative research is often criticized for its lack of external validity, or inability of the findings to be generalized to a larger population. However, qualitative research is valuable as the methodology provides methods and procedures for studying the perceptions of people's experiences. This interpretive, qualitative study was completed as an effort to extend the research on speech recognition programs by gaining students' perceptions. As a result of describing and examining the experiences of college students using speech recognition, this document provides insight into how the participants felt about these programs and how they used this particular software. Qualitative methodologies were employed to examine the students' perspectives. The methodology used to investigate postsecondary students' perceptions of speech recognition programs was described in this chapter. Interviews, field notes, observations, and artifacts from students' dictation were reviewed and coded. Each participant's case was analyzed

followed by a cross-case analysis for common themes. Knowledge of the participants and their settings assisted the reader in relating to the context.

CHAPTER 4

FINDINGS

Students' perceptions of speech recognition programs as a tool for meeting the demands of college academia were analyzed in this study. The results are presented. First, each participant's utilization of his or her speech recognition program over the course of the 2003-2004 school year is described. Then, the four research questions are addressed.

Case Studies

Case Study 1: Harvey

Speech recognition training. Harvey began speech recognition training a week prior to classes and concluded during the third week of the semester for a total of three training sessions. Sessions occurred at the local state university and lasted up to 90 minutes as a result of Harvey's procrastination and avoidance of the task at hand, despite the redirection.

During the first training session, Harvey created his voice profile for DNS Preferred Version 7. He selected the three stories he thought would be the easiest by choosing stories that were short in length. The stories he chose were: (a) "Talking To Your Computer," a description of speech recognition programs consisting of 883 words, (b) "Employment Request Letter," a cover letter for a job application containing 212 words, and (c) "New Product Manager's Electronic Mail Messages," a conglomerate of 13 email paragraphs with a total of 559 words. Harvey read the stories at a slow, steady pace without pauses between words or phrases, only stopping when he sounded out

unfamiliar words. I provided verbal prompts after at least two attempts to pronounce the word occurred. Harvey expressed his thoughts and gave rhetorical comments throughout the session as he continued to read. For example, while reading the first story, which described speech recognition, he read, “The training process takes only a few minutes.” In a louder voice he responded, “Excuse me, no it doesn’t.” He also commented, “I hate this stupid thing,” when he finished reading. Not sure what “hate” referred to, I asked for clarification, and he identified that the yellow arrow following the text along as he read did not stay “right on cue.” He felt the arrow was slow and should have stayed with the text he read.

At the second training session, the first task was for Harvey to watch a video tape of himself creating his voice profile. As I handed him the remote control, I told him he could stop the tape at anytime and provide comments on what he saw and was thinking now and during the previous session. Harvey responded by pointing to the door and saying, “The remote will be out there [in the hallway] . . . Then you can say bye-bye remote.” He commented that he did not like to watch himself on tape. Avoiding the task at hand, he changed the subject by asking questions about the camera that was hanging from the ceiling in the corner of the room. After I assured him the video camera did not work, I placed the remote on the table in front of him. He commented he would not stop the tape. I started the videotape and we watched Harvey reading the first story for his voice profile. He did not stop the tape. He looked around the room, as to avoid watching himself. Harvey’s laughing and comments in regard to his off-task behavior during the previous session and that I would have to transcribe everything he had said on tape

indicated he was listening to the tape although he did not watch the tape in its entirety. Harvey learned and practiced DNS commands during the remainder of the appointment.

The final training session occurred in September 2003. Harvey brought his tower into my office, and he loaded the speech program onto his computer. He then created his voice profile and demonstrated the program opened and responded to his dictation. While connecting his computer tower to the monitor, Harvey noticed the video camera recording and continued to mention this periodically throughout the training session. I assured him no one would see the tape and the majority of the time all I could see was the back of his head. At one point he held up the software box in front of the camera and laughed.

Harvey described the speech recognition training process as “boring.” When I probed further, he said that the boring activity was reading the stories. In addition, he commented that he disliked the program because during his practice dictation he would have to repeat commands, such as *go to sleep*. Repeating words and phrases while creating his profile also occurred. Harvey then took his computer home to utilize the program for any educational or nonacademic activity.

Fall semester. Harvey began classes at the local community college in August 2003. He was enrolled in four classes: Chemical Certification, Environmental Conservation, Native Vegetation, and Fundamentals of Writing II. The writing course fulfilled a general education requirement and the remaining three were courses for his major. Three of the four courses, Fundamentals of Writing II, Environmental Conservation, and Natural Vegetation, required written compositions.

Harvey was pleased with his fall semester schedule, despite the early morning classes. With a light-hearted laugh, he smiled and noted that his free afternoons were filled with one of many activities: sleeping, hunting, hanging out, working if he was scheduled, or doing absolutely nothing.

During the first three full months of school (September, October, and November), Harvey did not use his speech recognition program because he “never had the chance.” Opportunities existed for speech recognition to be used to complete papers; however, the hour breaks between classes was utilized to complete homework. Harvey explained the centrally located computer lab and library allowed for easy access to resources while remaining on campus. This assisted him in not having assignments at home to complete.

Harvey reported that he used the speech recognition program earlier in the week to complete two rough drafts for his writing class, during the December interview. The first paper, on the topic of black powder (Appendix H Sample 1), Harvey identified was supposed to be a three-to-four page draft. The draft I received was a one-page paper containing three paragraphs that consisted of nine sentences. Errors included two misspellings, one fragmented sentence, an incorrect use of an apostrophe, and the misuse of capitalization.

The second paper required a two-page draft. Harvey completed less than a page, specifically 10 lines (Appendix H Sample 2). Again, the paper contained three paragraphs consisting of nine sentences in total. No spelling or grammatical errors were identified in this paper; however, information was repeated in each paragraph. The

problem Harvey encountered with DNS was words interpreted incorrectly. Harvey reported liking the DNS program because papers could be completed much faster.

I observed Harvey spontaneously dictate a few sentences, in response to a writing stem, during the fall semester. Sitting in front of his computer with his headset on and his right hand placed on the mouse, Harvey pondered what to dictate. After a few minutes, he spoke in a choppy voice three to four words at a time. Pauses occurred between phrases as he waited for the text to appear on the screen before proceeding. “I went hunting on Monday [4-second pause – did not turn microphone off) and (20-second pause while he watched the screen]. Saw 3 deer period.” Harvey reacted in disappointment when incorrect text appeared or not at all. As mistakes occurred he made comments (e.g., “Now that messed it up.”).

Spring semester. Harvey enrolled in a total of 14 hours of course work during the spring semester of 2004. His classes were Pre-Algebra (a class he was repeating), Equipment Operation, AG Computers, and Wildlife Ecology. Although Pre-Algebra did not require papers, written essays were course requirements of the remaining three classes. Harvey began his morning with an 8:00 class and finished by mid-morning or late afternoon, depending on the day. Again, Harvey had either a one-or two-hour break between classes.

Harvey reported not using the speech recognition program. He laughed as he stated that he forgot about the program. The only time the program was used was when I requested he read a 50-word paragraph into the speech recognition program and correct the errors. As Harvey read the paragraph, he paused in between phrases. When he

finished reading the text, he immediately took off the headphones, laid them on his computer desk, and began correcting the errors manually.

Case Study 2: Mae

Speech recognition training. Training sessions did not occur before or during the fall semester due to conflicting schedules. To accommodate Mae's difficulty with receiving training at the local state university, speech recognition training was arranged to occur in her home.

Fall semester. Mae was a part-time student and a part-time employee when the fall semester began. She was enrolled in a three-hour database course at the local community college and an on-line course. She started a new job at a local department store a few weeks before classes started.

Despite efforts to begin training during the month of August, training sessions did not occur because Mae reported she was too busy. After several attempts were made over a time period of three-and-a-half weeks to begin speech recognition training, I concluded that meeting at the university was a barrier for Mae because she reported a lack of transportation and the responsibility of caring for her grandmother. Therefore, I accommodated Mae by offering to provide training sessions in her home and she accepted. Prior to beginning the training sessions, Mae's computer was updated to OSX and the iListen speech recognition program was downloaded onto her computer. After the computer was updated, training was arranged to begin during the last week of September.

Several attempts to schedule appointments occurred by telephone and email during the semester. However, many of these contacts remained unanswered. I recorded in my notes:

I feel as if Mae is avoiding me. The semester is half over and I feel as if she does not want to be bothered. I know that her grandmother requires care. Mae has reported taking care of her grandmother. I understand this and respect this. I wonder if participating in this study will be too much for Mae. If she does not want to participate or feels she is unable I wish she would just say this. I was unaware of these other circumstances. We really need to get training completed. I have a feeling that she wants to please people. I will see where we are at the end of the semester. If progress does not occur I want to know why. There are reasons for not completing training that are just as important as how the program is utilized.

When I arrived at our scheduled September appointment, Mae answered the door. At that moment, she informed me she had just returned from the doctor's office and had been sick the past couple of days. She asked if we could reschedule and we agreed to meet the following week. I agreed to reschedule the appointment for two reasons. Obviously I did not want to become ill. The second reason was because when an individual is ill, their voice generally changes and this would complicate creating an accurate voice profile.

Appointments scheduled were often rescheduled, due to illness or conflict with work schedule. For example, at the end of the semester, an appointment was scheduled after the Thanksgiving holiday. This appointment was rescheduled four times, resulting in an appointment after the new calendar year.

One appointment occurred during the semester. In early October, Mae recovered from her illness and training began. Sitting downstairs in the basement family room, Mae opened the iListen program and placed the microphone headset on. In the background

the television could be heard. When the program opened, Mae was unable to proceed. The directions informed Mae to read the text provided in the box. However, there was no text in the box to read. After troubleshooting for a half hour, Mae and I reached the conclusion that the program was installed incorrectly.

During one of our phone conversations, it was revealed Mae no longer had Internet connection because the bill had to be paid. Mae continued the conversation and said, "I dropped out of school." I inquired when and she replied just a few days ago. She informed me she was caring for her grandmother and working.

Spring semester. Prior to the spring semester, Mae decided not to enroll in any courses. She made the decision to work. Returning to school in the fall were her future plans. Training began in January. It was evident from Mae's surprised facial expression and comment that she was not expecting me. After engaging in conversation regarding the misunderstanding if the appointment was today or yesterday, Mae said to give her a minute. She closed the door, returned, and said to go downstairs.

Mae began the process of creating her voice profile during the brief appointment. Mae read the first five windows and then stopped. While she was reading, she ended up rereading and rereading the same text several times. Her voice became a little louder when she reread the text. I noted she also had difficulty with the words "period paragraph." When I noticed this, I silently asked myself if the program did not understand Mae saying her *P*'s. When Mae encountered difficulty with the program accepting her speech she used the skip button to avoid the difficult word. This behavior and her short responses to my questions indicated that she did not want to work on the

program. When she asked to stop I agreed and then asked a few questions and attempted to schedule an appointment. Once again I heard, "I don't know my schedule."

Attempts to schedule another appointment continued. Through both email and the telephone, I would ask for her to identify a date and time that was conducive to her schedule. Mae would respond to my inquiry by stating she did not have her work schedule or her calendar, but would contact me in a few days.

An appointment was finally scheduled for the middle of February. That morning she left a voicemail message and asked for the appointment to be rescheduled because her presence was required with her grandmother at the hospital. Therefore, the appointment was scheduled and occurred at the end of February. Mae completed reading the first story for her voice profile she started the prior month. At the conclusion of the session, I tried to schedule an appointment and was unable to because Mae reported not knowing her schedule.

After a few days had passed and I had not heard from Mae, I started contacting her again, and reached her on the last day of March. We talked for a few minutes before I turned the conversation to speech recognition, specifically the lack of progress. I reminded her that at the start of the project she had agreed to participate, which required involvement in training and follow-up sessions. I advised Mae to take a few days and evaluate what she wanted to do. I explained to her my willingness to provide the training appointments; however, she had to decide if she wanted to continue. I asked her to consider the time required for the computer work and her other commitments. She acknowledged that learning the program took time. I told her we would meet and discuss

her decision. Mae replied she would give it some thought. Before ending our conversation, Mae mentioned her plans to return to school for the fall semester.

A week later, Mae contacted me. The purpose of the telephone call was to inquire about a CD burner she had purchased for her computer that did not work. After answering Mae's questions, she informed me she was busy with work and dealing with her grandmother's wake and funeral. I gave my condolences, and the conversation changed when Mae said that she thought she could meet next week. She identified a day and then doubted herself. After checking her calendar, she scheduled our meeting for 3:00 p.m. on April 21, 2004.

I met with Mae to discuss speech recognition on the 21st. We sat at the dining room table. The television could be heard in the adjacent living room. Mae expressed her desire to discontinue the speech recognition training. The time commitment most influenced her decision. Mae said she had tried completing the training, but it was difficult to schedule appointments. Mae continued the conversation by adding she had the computer available, but had to ask herself, "Do [I] want to take the time to do it?" Her ultimate answer was to terminate her participation in this study.

Over the course of this study, Mae spoke of completing college; however, she could never state what she wanted to study. During this research, several potential careers were identified - - dental hygienist, secretarial, nursing, journalism, non-specific retail, non-specific arts, and accounting. Mae acknowledged she had wide interests.

Case Study 3: Mark

Speech recognition training. Mark began and completed his speech recognition training sessions for DNS Preferred Version 7 prior to the fall semester of 2003. During the first session, Mark completed a five-minute writing sample (using paper and pencil) and read an excerpt of “Alice’s Adventures in Wonderland” (consisting of 1330 words). During the second session, Mark finished creating his voice profile by reading an additional three stories. The first story, “Sales Letter,” was short, 535 words. The second story, “Employment Request Letter,” contained 212 words. After completing “Employment Request Letter,” Mark chose to read another story, an excerpt from “Dogbert’s Top Secret Management Handbook,” consisting of 3400 words. Mark read in a continuous fashion pausing for unfamiliar words or when the program signaled for him to reread, due to what appeared to be for omitting words or substituting words. I provided verbal prompts for words Mark had difficulty pronouncing after two attempts occurred.

During the remaining seven sessions, Mark learned the commands, practiced dictating, and corrected errors. When asked to dictate, Mark either spontaneously dictated or read pre-written material. During the training sessions, he did encounter some difficulty with the command *go to sleep*. When he gave the command, it was not always interpreted correctly; therefore, the microphone would remain on, and text would appear. Dragon NaturallySpeaking has a second command phrase available for the operation of turning the microphone off. Mark used the second option command, *stop listening*, and discovered it was more effective.

Despite encountering difficulty periodically, it never appeared to bother him as he kept a calm voice and continued trying. Rather than perceiving the difficulty as challenging, Mark found it to be interesting, as he would laugh. I noticed he corrected errors either during his dictation or after completing his dictation. During a training session, Mark commented not remembering what he dictated by saying, “I forgot what this thing was supposed to be,” when he attempted to correct the errors.

At the last training session, Mark brought his computer into my office at the local university and loaded the program onto his computer. Mark created his voice profile by reading “Dave Barry in Cyberspace,” “Dogbert’s Top Secret Management Handbook,” and “Employment Request Letter.” He dictated three sentences and corrected errors to ensure the program worked properly and took the computer home to be used at his discretion.

Mark was asked to share his thoughts of the DNS program. “Nice to have”, “easier to say something”, “less time consuming”, and “use words before I had to look up”, were his responses. Mark expressed his feelings that the speech recognition program would result in time saved when writing papers and would make the writing process easier. He explained he would be able to put his thoughts down by dictating his ideas that were usually difficult to word correctly when writing using traditional methods. Mark also explained that using the speech recognition program would allow him the opportunity to use words that he may not have used in the past because he would use smaller words to avoid having to look up the correct spelling of difficult words. In

addition, Mark felt it was easier to talk and have the computer type than to type the papers himself.

When asked about the speech recognition training, Mark said it was easy because of the explanations and assistance. He found using the International Communication Alphabet to spell words difficult because the DNS program would not always recognize the pronounced letter. Learning voice commands was a relatively easy task. He commented that once the basic commands were known, others could be figured out without having to reference the manual.

Mark appeared to enjoy the training sessions as he arrived on time for majority of the appointments and with a willingness to learn. He felt learning the speech recognition program was an adventure. Throughout the sessions, he would periodically make funny faces. Mark expressed that he enjoyed watching tapes of himself because he liked to view the funny facial expressions he made. He identified himself as a fun person who was making the training sessions interesting.

Fall semester. Mark was enrolled in two courses for credit, math and anthropology, and a non-credit college seminar course required for all students during the first quarter. Course requirements included the completion of tests, textbook questions, essay papers, and math problems in addition to participating in campus activities for the college seminar course. Mark's class schedule consisted of a late morning class and an early afternoon class, followed by football practice from 3:30 until 5:30 or 6:00 p.m. He was also required to attend the mandatory study hall for all athletes from 7:00-9:00 on Monday and Wednesday evenings.

Mark was enrolled in two morning classes, Principles of Sociology and Reading for Critical Comprehension, during the second quarter. The expectations for the courses required class attendance, tests, and completion of written questions. Further inquiry regarding class requirements revealed assignments for the reading course involved writing responses to the workbook questions directly in the book, which did not allow for utilization of the speech recognition program.

Mark described the second quarter as “totally different.” Half way through the second quarter football ended; therefore, creating additional free time in the afternoons. In addition, Mark had Monday and Wednesday evenings free as he was not required to attend study hall because he obtained above a 2.5 grade point average during the first quarter. To occupy his afternoons, Mark signed up to play intramural basketball.

During the first quarter, Mark emailed and stated,

Hi This is Mark. Just emailing you that I have everything set up and I have been using the programs and it has been working very well for me. I don't have internet in my room yet but i wil[l] have to stop by more often to see if you have emailed me back. Mark.

He used the speech recognition program to dictate responses to questions for his anthropology class (Appendix I, Samples 1-5). He stated he used it because he was “too lazy to write it out.” The majority of Mark’s responses consisted of one or two sentences for each question with only a few responses containing several sentences. One response consisted of seven sentences. He stated he didn’t have difficulty, except for the words the program did not know so he just typed the word. He referred to the manual to learn how to dictate a numeral so the number would not be spelled out.

Further discussion revealed Mark also used the program to dictate four papers. Two of the papers were for his anthropology course. The first paper (Appendix I Sample 6) was a one-page paper discussing female genital mutilation. This two-paragraph paper contained two grammatical errors, a subject-verb disagreement, and a verb confusion. The second paper (Appendix I Sample 7) was a reflection paper on an assigned article he read. One grammatical error was noted in the seven-paragraph paper. The third paper (Appendix I Sample 8) was a paragraph summary of his class community project. The last paper (Appendix I Sample 9) was a one-page reflection paper consisting of four paragraphs. Grammar and punctuation errors were not identified in Mark's third or fourth papers.

Use of the speech recognition program during the second quarter decreased. When asked if he had used the speech recognition software he reported, "I haven't had anything to use it with." However, Mark shared he had used the program to help his girlfriend with some of her homework. He explained that he had completed his homework, and she had a lot to finish, so he decided to help her. One of the assignments Mark completed was a reaction paper (Appendix I Sample 10). With his girlfriend in the room, Mark sat at his desk, read the quotes word for word into his DNS program, and subsequently, spontaneously dictated his reactions, ideas, and comments. The editing he left for his girlfriend to complete.

The second assignment consisted of a collection of poems. Mark sat at his computer and read the poems into his microphone headset while the speech recognition program produced the typed text. Again, he left the editing for his girlfriend.

Mark also explored utilizing the speech recognition program for non-academic activities. He shared using the speech recognition program with Instant Messenger (IM). This occurred because several of his friends were attending other colleges and universities in different states and they kept in touch with one another by using IM. Mark described his experience:

I used it for IM, Instant messenger . . . I used it for that a little bit . . . I was too lazy to figure out how you go from window to window [using my voice] . . . but I would just click on it and say what I want to say and sent it then click on the other window if I wanted to talk to someone else . . . And send it. . . It was pretty good. I don't usually don't say a lot, long things. . . So it is like, ok, all right, "what are you doing". . . Short things that I usually say. Then if I did messed up people are use to me messing up typing so they think, uh, it doesn't really matter, he always messes up. . . I just left it [the errors].

Mark concluded by stating the errors "made the conversation more interesting."

In addition to instant messaging, Mark acknowledged that he used the speech recognition program for surfing the Internet and emailing. With additional free time during the second quarter, Mark reported he experimented using the speech recognition program once to surf the web. While on the Yahoo website, Mark gave commands that allowed for manipulation of the cursor within the webpage without using the mouse or keyboard. Misunderstanding of commands occurred as he said, "I would say words and it (program) would accidentally close the window. And I accidentally closed the window a couple of times." Other commands were understood as giving the command *close that* "would close the active window." Using the speech recognition program was not out of necessity, rather, "just trying to have fun with it."

I observed Mark dictating spontaneously and reading pre-written material over the course of the fall semester. Differences between spontaneous dictation and pre-written

dictation were noted. For example, speaking speed. Also, brief pauses were noted to occur prior to the word *period* during spontaneous dictation. During one observation, Mark sat at his computer desk with his microphone headset on, hands in his lap, eyes on the screen as he dictated the following:

Today is Wednesday period. I had to get up early to drive to school period. I was late for class because there was road construction period. (5-second pause) Class was boring because the teacher didn't know what he was doing period. And then I cleaned my room before people came period. (6-second pause) And then (6-second pause) I waited for those people to come period.

The few pauses between word phrases could have been because Mark dictated spontaneously with no purpose or topic provided. I regarded brief pauses, three seconds or shorter, as a breath. Mark used six different commands to move the cursor within the document to correct the errors. For example, *delete that*, *move down five lines*, *backspace*, and, *move right one character*.

When reading prewritten text, Mark held the paper in his left hand and kept his eyes on the text. He read the following text in a continuous fashion never pausing between phrases. Punctuation marks were dictated.

It is also important that the sender use your full name comma no nicknames or initials comma and no room numbers period. Additionally comma when sending mail comma be sure that if you send odd shape or rigid items exceeding one-fourth inch in thickness these are in not acceptable in letter size paper envelopes period. Such items must be mailed in a small box or padded envelope period. If you of any questions about receiving or sending mailing comma please visit the mailroom or extension five-three-one-one period. Stop listening.

After reading the paragraph, Mark proceeded to correct the few substitution errors using voice commands. He maneuvered the cursor within the document using the *select (word)* command. During the correction process, Mark fixed the errors that occurred as a

result of the program misinterpreting voice commands given. For instance, Mark gave the command *scratch that* and the program inserted text, which was incorrect and resulted in Mark using the command again to eliminate the extra text.

Spring semester. The spring semester brought changes for Mark. At the beginning of January, Mark relocated from the Midwest to Florida. During his 16-week internship experience at Walt Disney World, Mark resided in a furnished apartment with an assigned roommate. While the necessities such as a stove and a refrigerator were provided, the extras such as a computer and a television were not. Mark took his computer for the purpose of having access to the Internet. Mark's responsibilities as a full-time custodian were to assist in the maintenance of one of the several theme parks. Going to the beach, sightseeing, and visiting the theme parks filled his free time.

Despite a required one-paragraph description paper for his internship, Mark did not use the speech recognition program. He reported not using the program for the paragraph because he did not want the paper to be too long. Mark also explained using his speech recognition program did not occur because of not having any assignments to type. Mark added the lack of time influenced his decreased use of his computer. During the course of the semester, I noted a decrease in his email, as I received only one email in response to the several emails I had sent. This was unlike the previous semester when I would receive an email response from Mark within a few days.

Case Study 4: Renee

Speech recognition training. Training sessions for Renee began immediately during the first week of August, prior to the beginning of classes in the fall of 2003.

During the first training session, Renee completed two tasks. First, she completed a five-minute writing sample using paper and pencil. Next, she created her voice profile for the speech recognition program DNS Preferred Version 7 by reading three stories: “Dave Barry in Cyberspace” (4982 words), “2001: A Space Odyssey” (1082 words), and “Employment Letter” (212 words).

In the appointments that followed, Renee learned voice commands for the program. During these sessions, a command phrase was introduced and an opportunity to practice. When I asked Renee to dictate, she requested prewritten material. I had available a one-page story or a history textbook, from which she could choose. Renee read the material in a continuous fashion and corrected errors after having read the prepared passage. Periodically, I would provide an example sentence or ask her to dictate a specific sentence.

Renee brought her computer tower into my office during the last session. As I provided prompts and explained the visual cues to look for when connecting the computer tower to the monitor, Renee completed the task and loaded the program onto her computer. After she finished the installation of the program, she created her voice profile and proceeded to open MSWord, so she could dictate a few sentences to ensure the program worked correctly. Renee discovered a few programs during the updating process were not installed or completed as she tried to open the MSWord. Noting this, I asked her to dictate into Dragon Pad to ensure that the speech recognition program worked. As a result of the improperly installed programs, Renee did not have her computer for a few days while programs were re-installed. When her computer was

returned, she connected her computer independently and had unlimited access to her speech recognition program.

Renee shared her thoughts regarding the speech recognition training she received. “[It] was a good training program,” Renee said. “It was just very boring.” She explained that boring referred to reading the stories for the voice profile. Renee added that the program was not difficult. She described it as easy because you just sat down and talked. The difficult task Renee identified was “memorizing the commands.” With additional use, she felt that over time she would have the commands memorized.

Fall semester. Renee’s fall semester consisted of 12 hours of course work. Classes were: Child Development, Field Experience, Safety and Nutrition, and Orientation to Child Care. Course requirements consisted of written assignments, projects, quizzes, and tests. A typical day for Renee began with field experience in the morning at a local day care center followed by classes in the early afternoon. When classes were completed, she typically worked a few hours in the late afternoon or early evening.

Opportunities to utilize the speech recognition program occurred throughout the semester. During the fall, Renee utilized the speech recognition program to complete an assignment that required creating an activity file box. The assignment required locating different finger play activities and organizing them into categories. After locating a number of finger plays, Renee read the prewritten finger plays into her microphone headset and the speech recognition program typed her dictation. She reported manually correcting errors after reading the poems. Renee attempted to use voice correction

commands, but experienced difficulty with the program selecting the correct text when she gave the command *select (word)*. Renee explained it was easier for her to correct errors manually after reading the material into the program because when she read, her hands held the material and were not placed on the keyboard, which complicated corrections at that point. In addition, her eyes were on the material; therefore, she did not see the errors until she looked at the computer screen. Renee concluded by saying she felt more comfortable correcting errors manually.

Renee did not use speech recognition program for other assignments. She stated she had completed a lesson plan and a cooking file. Using her DNS program for these assignments did not occur because she had completed some of the course requirements between classes. Renee stated the lesson plan she typed because of the specific outline required. She decided not to use the speech recognition program for the cooking file assignment because she did not know how to give the commands for measurements when halves were used (i.e., 3-1/2 cups).

During observations Renee dictated prewritten text, from either a magazine or a book. She read in a continuous fashion and kept her eyes on the text. Only brief pauses, less than three seconds, occurred at the end of a sentence. This would be expected as periods allow the reader to take a breath. She read the following prewritten text from a children's craft book into her computer and said the punctuation marks.

Help you child tear or cut a large blue square of strips of red paper glue the strips and square onto white paper to make a flag period. Stick starts on the blue square period. Tape the flag to a dowel and fly the flag flag proudly exclamation point. Stop listening.

When Renee finished reading she gave the command *stop listening* for the program to end its dictation process. The errors noted with this dictation consisted of five substitutions (i.e., *care* substituted for *tear*) and one omission (i.e., *or*).

Spring semester. During the spring semester of 2004, Renee enrolled in a total of 15 hours consisting of Curriculum: Birth Through Two Years, Basic Mathematics, Parenting Relationships, Field Experience, and Curriculum, Environment, and Teaching Materials. She continued to work part time. Opportunities to use the speech recognition program during the course of the spring semester did not materialize. Renee said, “I didn’t have a lot of papers . . . I had (pause) like projects, but I really didn’t have to write anything,” despite the course requirements of papers, presentations, tests, projects, and lesson plans.

Case Study 5: Travis

Speech recognition training. Travis had a previous experience with a speech recognition program and knew the amount of time required. He voiced his opinion that training of students should occur before school. He said

have their training session in the summer, get their voice recognition, get that taken care of so so when they come back they don’t have to worry about [it]. . . . if they are like me they don’t got the time to give up.

Despite this knowledge, training did not begin until after classes began.

Fall semester. Travis was enrolled in 14 hours of course work consisting of China, Soviet-Russia, American Thought and Government, and Portuguese Culture and Language that contained a lab. He identified opportunities to use the speech recognition program existed as course requirements included papers and tests. However, using the

program during the fall semester did not materialize as anticipated. Due to various obstacles, including microphone problems, student illness, and family issues, training took place throughout the fall semester.

Training sessions occurred at his residence and generally on the weekends at his request. He expressed having more time available on the weekends, as school did not interrupt him. During the first session, Travis began the process of creating his voice profile. He selected and read the story titled “Part I of Treasure Island.” At the second training sessions he read the narrative “Treasure Island Part II.” Travis selected to read “Growing up Digital Part I” at his third training session. He expressed wanting his speech program to work accurately, so he chose to also read, “Overview Part 2 and a Ghost Story.”

While creating his voice profile during the three training sessions, Travis took several breaks to take a drink and allow his voice an opportunity to rest. Travis commented his voice was sore and dry after reading the stories. He added after completing a training session, he was not able to speak with his normal voice volume; his body ached as a result of sitting for an extended amount of time. Travis discussed having to drink a lot of water after dictating. I noted during the sessions Travis always had something to drink within reach, typically Mountain Dew. He added that speech recognition program should contain stories with today’s modern language, not formal English, as in “Treasure Island.” He shared his feelings that the stories needed to contain punctuation, so the reader could pause and catch his or her breath in addition to a brief pause for one’s vocal cords.

Travis read prewritten material during a practice session. As he held the book in his left hand, had the microphone on his head, and his eyes on the textbook, Travis read the following in a relaxed voice as he paused between word phrases: “A bright triumphant day (6-second pause while he looked at the screen) in a day like today you forgot about your weakness (70-second pause) your uncertain (7-second pause – he looked at the screen) your illnesses and everything is Crystalline.” Travis stopped dictating and turned off the microphone using the mouse. Errors included five substitutions and one word insertion. For example, the word *forgot* was substituted for the dictated word *forget* as well as *concerned* substituted for *uncertainties*. The word *he’s* was inserted.

Further observation revealed some of the pauses during his reading may have occurred because he would watch the screen periodically. Travis reported his pauses took place because he wanted to ensure the program was working, and it also allowed him to take a breath. Short pauses of three seconds or less were not recorded.

After completing his speech recognition training, I asked Travis to describe his experience. Rather than describing it, he shared with me what he felt should occur. He suggested training should occur prior to the semester, when students would have more time. He commented college students did not have the time to devote to learning the speech recognition program while preoccupied with their courses. He identified time limitations as a barrier for learning the program. Travis discussed the creation of his voice profile as a time-consuming task. Reading the stories took a total of 3 hours: 80

minutes for the first session, 40 minutes for the second session, 23 minutes for the third, and 40 minutes for the fourth.

When asked about learning the voice commands that allow manipulation of the cursor, Travis said he wished the commands were shorter because giving the voice commands added time to the process of writing a paper. Further explanation revealed he would like some of the commands to be shortened to two-word commands for the purpose of having less to memorize.

Spring semester. The spring semester did not look promising for Travis. During the winter break, he encountered complications with eligibility for housing and obtaining financial assistance for tuition. Travis said this happened because he had been flagged as not making satisfactory academic progress. Further explanation revealed he had received two incompletes for his fall 2003 classes. Eligibility for financial aid states students enrolled in 12 hours of credit must satisfactorily complete 9 of the 12 hours. Completing only six hours resulted in Travis losing his financial aid assistance. He therefore, was unable to register for spring classes and remain a resident in university apartments. Travis moved in and lived with a friend while he waited for the outcome of the appeal he submitted.

When the matter was resolved, at the beginning of February, Travis enrolled for spring classes and on-campus housing. Upon being assigned a room, Travis moved into the residential hall and began attending classes the third week of the semester. Enrolled in 12 hours of course work, classes consisted of Introduction to History, Europe to 1688,

Greek Mediterranean, and an Independent study regarding the 1960s. Again the requirements for the courses consisted of papers and essay tests.

Travis utilized the speech recognition program to complete four papers over the course of the spring semester. Prior to midterm, he completed an assignment he identified as a movie review (Appendix J Sample 1). Travis dictated the paper, consisting of a single-spaced page and a half, in one day and edited it the next day.

The second paper Travis dictated using the speech recognition program was a midterm essay for the course England since 1688 (Appendix J Sample 2). This paper was four and half pages long and was dictated over a five-day span.

During finals week, Travis dictated a final exam for his England since 1688 course (Appendix J Sample 3). The completion of this paper, from dictation to editing, took several hours, which occurred over two days.

The fourth paper (Appendix J Sample 4) was on the Boer War. This paper was completed during the summer of 2004. Travis reported completing the text of the paper during the spring semester and the reference and dead-end page during the summer.

Observations revealed that Travis dictated course assignments in phrases, varying in length from three words or more, manually corrected errors, and had difficulty inserting punctuation during dictation. I noted pauses also existed as he manually corrected errors. These behaviors occurred in the following example of his dictation:

Used such techniques (3-second pause) as blistering of the skin (12-second pause) restraining and strapping the king down so he could (3-second pause) so that he could. Go to sleep.

He could not (3-second pause) move or talk (4-second pause) comma Dr. Wilson (3-second pause) would use these techniques (4-second pause) on the King (3-

second pause) when he felt that the King was out of order either physically or (3-second pause) verbally (8-second pauses) he would comma (7-second pauses - he uses the delete key to erase errors) comma (4-second pause) he would also do this (10-second pause as he uses delete keys) he would also use this method (9-second pause - he uses the delete key to erase errors) use this method (3-second pause) when the King (3-second pause) refused to do what the doctor asked (7-second pause) period. (5-second pause). Go to sleep (quickly adds) computer go to sleep. (4-second pause) Computer go to sleep. (4-second pause) Computer go to sleep (6-second pauses while he uses the delete key to erase errors that appeared in the text).

I asked about the pauses, and he responded he didn't want to get too far ahead of the computer because there could be a lot of mistakes. He added that speaking in phrases was due to his thought process. He clarified that pausing was the result of processing what to say next. I also inquired about dictating punctuation. Travis identified spontaneous dictation as a difficult task because he had a hard time visualizing where the periods went. He explained for him it was easier to see punctuation when writing on paper.

During one observational period, a friend assisted Travis with editing his paper. During this particular session, she sat at his computer and read the paper aloud to him. Travis sat on his bed, which did not allow him to view the computer screen. He was instructed to stop her when information needed to be added or clarified and when a grammar or punctuation error existed. When he did not stop her, she would quit reading and prompt him by saying, "You need to stop me." She would reread the sentence, identify the error, and correct the mistake.

Travis's friend spent the rest of the evening, until 12:30 a.m., proofing his paper. Several writing rules were explained as his friend discussed proper use of punctuation marks. For instance, a period she stressed separated two different topics. The majority of

the corrections she noted appeared to be run-on sentences. She also focused on the use of commas. She enforced that an introductory clause needed a comma as well as a list or series of items. In addition to correcting the errors for Travis, his friend tried to teach him writing rules so he understood why he needed to use punctuation. To help Travis understand the corrections, she would read the text, identify a word or phrase, and ask him what purpose that word or phrase served. She expected a response of interrupter, introductory word, or conjunction. Finally, she instructed Travis to avoid using the word *but* or the word *and* at the beginning of a sentence.

Travis answered her questions with some hesitation as he pondered for answers. At times, he just gave a response as if he was tired and wanted to be done with the paper. This six-and-a-half-page paper took over two-and-a-half hours to dictate and three-and-a-half hours to edit, resulting in a total of six hours.

During another observation, Travis was completing a paper that required a reference and dead ends page. I prompted Travis with various directions when he paused or asked questions that indicated his unfamiliarity with a specific computer task. For example, Travis commented his computer would not open the MSWord program. As I glanced at the computer screen, it appeared to me he might not have understood when a program was open. When he made this comment, the program MSWord was open, but he did not realize this, so he clicked on MSWord icon again and waited for a blank document to appear. I pointed to the screen and told him that at the top, left hand corner of his screen next to the blue apple, the word "Word" appeared, indicating an opened

program. I demonstrated that clicking on the paper icon in the toolbar would open a new document.

I also supplied directions for other computer skills during the session. When he paused to save his document, I brought to his attention the location his document would be saved. It appeared he saved documents; however, he didn't know where the documents were placed. I also provided instructions for him to create a folder where he could keep his spring class assignments. In addition, I provided prompts regarding the use of bold and underlined text. Finally, I demonstrated how he could create a formatting palette.

Travis questioned me regarding how to cite references. I asked if he had a reference manual. Travis replied he did, but didn't know where to locate it due to his ongoing unpacking. He added he knew I was familiar with American Psychological Association (APA) and that the Turabian style was similar to APA. Often I reiterated my familiarity with APA and that I did not know how to reference materials using Turabian style. Travis accepted my input by responding either, "You're probably right, and I'm probably wrong to be honest," or "It's pretty similar. It is almost exactly the same. I think our main thing is punctuation differences." At one point Travis stated, "And if I am wrong he [professor] can yell at me. At least it is an effort. Right?" Travis commented he had waited for me before completing the dead ends page and bibliography because he knew I was familiar with referencing formats.

While Travis dictated, errors occurred. One reason for these mistakes Travis identified was due to noise within the environment. While living in the residence hall,

errors were attributed to the noise from neighbors or individuals walking through the hallway. While living in an apartment, the roommate's television was identified as interfering with the speech recognition program.

Research Questions

Although the participants' experiences as users of speech recognition programs were not all the same, similarities did exist. This became obvious as I observed, conducted interviews, and analyzed their written documents. The similarities and differences will be presented as each of the research questions are answered.

Research Question 1: How do students with learning challenges perceive the speech recognition training process?

Participants responded to interview questions to indicate how they perceived the training process. To assist in their recall of training sessions, participants viewed previously taped sessions. Observational notes were gathered. The participants in this study described the training as a relatively simple process, although boring and time consuming.

Simplicity. Interviews and discussions of speech recognition programs with the students revealed three of the four participants who completed the training sessions identified the training process as simple. The students in this study did not identify any particular task to be difficult. From Harvey's perspective the training process was easy because, "it was just reading." Renee also expressed similar feelings about the program when she said it was easy because you just sat down and talked. Mark said, "The training

was easy. Not hard at all.” Mark elaborated by saying he felt that the ease of the training was because he received instructions and prompts as needed.

Boring. Although the training sessions were perceived as easy, they were also identified by some of the participants to be “boring”. Harvey expressed his feelings regarding reading stories for his voice profile by saying, “this is beginning to get boring.” Harvey continued and said, “I hate this stuff.” Observations of Harvey’s training sessions revealed the training process did not capture his attention. His off-task behavior, such as changing the topic of discussion, asking irrelevant questions, or stalling for time indicated training the program to learn one’s voice was a tedious process. After completing training, Harvey commented that the process “sucks.” Asked specifically what he was referring to, he again identified reading the stories over and over because he had to read stories in order to create his voice profile on his computer.

Renee’s feedback paralleled Harvey’s. The training process was boring, specifically, reading stories for the voice profile. She acknowledged it was not a hard process “just very boring.” The boring aspect of the training may have strongly influenced participants’ desire and enthusiasm to use the program.

Time consuming. A substantial amount of time is required for an individual to become a proficient independent user. The participants expressed the speech recognition program required time and dedication.

Travis articulated the training process required a considerable amount of time and commitment from an individual. He further indicated time constraints for college students are factors by stating:

When you have a college schedule that lasts 16 weeks, 16 weeks is it. I can't give eight to train something, so I can use it the last eight. I don't have the time. I have the time here and there, but I don't have the constant time of sitting down like you need.

Travis provided recommendations concerning the time commitment by saying, "Have [the user's] training session in the summer . . . get that taken care of so so when they come back they don't have to worry about it. If they are like me they don't got the time to give up [during the school year]."

Mae also acknowledged time as a major factor and that an individual had to be willing to set aside time to learn the program. She stated when she did have some free time, for instance, after work, she just really wanted to relax and not have to learn something.

Renee commented traveling across town to the university for training was time consuming. Arriving at the appointments was not a difficult task for her, but she noted it took approximately 40 minutes per round trip. In addition, scheduling appointments required her to meet in the morning, prior to work.

Research Question 2: After training is completed, how do students utilize speech recognition programs for college academic demands over an extended period of time?

Two themes emerged as the data were analyzed. The first theme was dictation style used to complete academic requirements. The second theme to emerge was the type of correction procedures used.

I asked the question, "How do students use speech recognition programs during college?" I personally had identified speech recognition programs being used to dictate papers and for creating study notes from assigned readings and class notes. Participants

demonstrated speech recognition programs used for completion of activities such as question and answer assignments and any activities requiring reading of prewritten text. While answering the question of how, I discovered the germane question was not necessarily the activity students completed, but rather, the procedures students used.

Dictation style: Prewritten and spontaneous. It became evident as the participants in this study used their speech recognition programs, that besides spontaneous dictation, speaking into the microphone ad lib, reading aloud prewritten material was a second alternative. I assumed the speech recognition programs would be used for spontaneous dictation. Two of the participants demonstrated different uses. Renee utilized the program for reading prewritten material only. During training, this behavior occurred as she would request to read something from a book. When I asked her to dictate spontaneously, she commented that she didn't know what to dictate. When probed further, she added she liked to have something to read or at least an outline. Her behaviors were consistent with her comments as she always chose to read text when I asked her to dictate. She also used her speech recognition program for completion of an assignment requiring reading prewritten material.

After having the program in her home for a few months, Renee reported she found reading prepared material easier because she didn't have to think about what to say. In addition, prewritten material avoided the pauses that occur during spontaneous dictation due to the user thinking about what to say and the avoidance of extra sounds (i.e., breathing, sighs, and umms) that can be interpreted as words by the speech recognition program.

Mark also demonstrated speech recognition programs as a tool for reading prewritten material. As he completed an assignment for his girlfriend, he read poems into the program and produced typed text. For his anthropology question and answer assignments, Mark located the answers in the textbook, read the answers to the speech recognition program, and allowed his responses to be typed.

Dictation occurred for three of the participants. Travis used spontaneous dictation to complete course requirements. Sitting at his computer desk, Travis dictated without any notes or textbooks. He identified he had to spontaneously dictate because writing was a difficult task, and his handwriting was basically illegible. He added that he has a mental outline of his paper in his head before dictating. Mark and Harvey also used spontaneous dictation to complete essays. Mark commented that when he completed a couple of assignments for his girlfriend, the unplanned dictation was difficult. He stated, "It was kind of hard because after I went through, I really didn't remember what I was saying. I wasn't paying attention to what I was saying; it was just coming out."

Composing a written paper appears to require more than just sitting down and talking to one's computer. As I observed students' dictating behavior and reviewed their transcribed documents, it became apparent that composing a written document through the processing of dictating to a speech recognition program might be a completely different process than composing written text using a keyboard or a writing utensil.

Correction procedures. Correcting errors during the dictation process can be accomplished through voice commands. However, I witnessed students correcting errors manually. Students used either only the keyboard and mouse or a combination of the

keyboard, mouse, and voice commands. Only once did I observe voice commands used by themselves.

Travis said he used the keyboard for correcting errors because it was “a helluva lot easier.” He explained that correcting errors was a multiple step process (i.e., “Select recreation. Begin spell. R-E-C-O-G-N-I-T-I-O-N. End spell”). He also identified correcting errors by voice required him to stop, switch his thoughts from the subject matter of the paper to correction commands, recall the correction command, give the command, and switch his thoughts back to the paper. His behavior, pausing during dictation, suggested time is required for processing the steps. Travis further explained that using voice commands to correct errors had not become an unconscious and automatic act like the keyboard and mouse.

Harvey used a combination of voice, keyboard, and mouse to correct errors. For example, Harvey corrected errors by highlighting the incorrect word using the mouse and saying, “Scratch that.” This command removed the text. Other voice commands used included *go to sleep* and *wake up*. Harvey then continued to dictate. He perceived utilization of voice correction commands resulted in additional errors to correct; therefore, correcting errors only by voice was an inefficient manner and it did not occur. Harvey corrected errors during and after dictation.

Mark corrected errors after completing his dictation by using either the keyboard and mouse, his voice, or a combination of the three. On one occasion, I observed Mark using only his voice to correct errors. Sitting at his computer with his hands in his lap, he dictated and gave voice correction commands. During the second observation, Mark

corrected mistakes using a combination of his mouse and voice. When questioned why he used both the mouse and keyboard, Mark responded that when the program had difficulty understanding a particular word he would manually type the correct text.

Unlike Mark's approach, Renee did not use any voice commands for corrections. Renee said after reading the poems she attempted fixing the errors by voice but encountered difficulty and returned to correcting errors manually, using her keyboard and mouse. Renee stated that utilizing the voice correction commands resulted in misinterpreted commands; additional errors to correct. As a result, correcting errors with voice commands took longer than manually fixing the mistakes. She also stated her eyes remained on the prewritten text while reading; consequently, correcting errors occurred after the text had been read. This appears logical since an individual's eyes are on the text being read and not the screen as when one spontaneously types using the keyboard.

Renee also reported she had always used a keyboard; as a result, she was familiar with it. Using a keyboard as the tool for input was what she learned and used during her educational career.

The students voiced and demonstrated their preference to manually correct errors using the keyboard and mouse instead of voice commands. Voice commands produced additional errors that led to additional work and more frustration.

Research Question 3: Are there positive and negative factors affecting students' utilization of the programs in the natural living environments?

The MPT model is a resource designed to assist in identifying possible ways to prevent technology abandonment. The model was used to analyze the degree to which

the participants of this study used their speech recognition program and influencing factors of program use or nonuse in the natural setting.

The first component, setting (Appendix K), was ideal for Harvey's use. The location of the computer in his bedroom allowed him to obtain privacy by shutting his bedroom door. In addition, the computer remained in an unobtrusive location of the home. Support also existed in Harvey's use of the assistive technology. His mother provided support by ensuring others did not bother Harvey. She reported asking Harvey's brother not to go upstairs when Harvey was using the program. These indicators support an optimal user. The pressure to do well in school and use the speech recognition program Harvey felt may have contributed to his limited use. This factor suggest partial/reluctant user.

The second component is the person. When Harvey's characteristics were identified and placed on the MPT model, the person factors ranged between optimal and avoidance. Harvey was generally cooperative during training and interview sessions. He demonstrated sufficient computer skills and knowledge for using the program independently. His patience and relatively positive life experience were two other ideal factors. These factors are identified as characteristics of an optimal user. Harvey's lack of motivation and embarrassment are two factors identified in both the partial/reluctant category and the avoidance category.

The final component of the model is technology. Harvey did not report any problems or difficulty using the program. For him, it proved to be reliable. The DNS program was easy to use for dictating, but not for utilizing voice commands. Harvey

demonstrated using only a few voice commands and commented he did not use many commands because he had to memorize them. In addition, having the keyboard, an alternative option to the speech recognition program, influenced use of the program. Finally, access to computers at school contributed to his limited use of the speech program.

When these characteristics of the three components of the MPT model are plotted, Harvey falls in the range of being a partial and optimal user. At the end of the fall semester, he used the speech recognition twice. By the end of the spring semester, Harvey ceased to use the program. Despite a few positive factors that would suggest a good match between the user and the technology, Harvey identified his self-consciousness as a contributing factor to his limited use and avoidance.

When Mae's characteristics were placed on the MPT model (Appendix L), the characteristics revealed abandonment occurred. Milieu, personal characteristics and preferences, and the technology were all contributing factors to her lack of use. Factors identified for her environment fell in the categories of partial/reluctant, avoidance, and abandonment. A lack of support may have contributed to her nonuse. Mae identified other obligations and over loading her schedule as factors. The location of the computer within her home was not an ideal setting for using speech recognition. The open area in the basement served as a multi-purpose room for entertaining, relaxing, working, and sleeping and did not provide adequate privacy. The changing family (i.e., siblings moving in and out), work responsibilities (i.e., 20 or more hours a week), and family obligations (i.e., caring for grandmother, cleaning, cooking) were contributing factors in

Mae's abandonment of the program. For Mae, the environment was not conducive to her use of the speech recognition software.

Mae's personal characteristics ranged from reluctance to avoidance. These characteristics included impatience, embarrassment in using the device, lack of motivation, and the technology only partially fitting into her life. Mae identified herself as having little patience and not wanting her family members in the vicinity when she used the program. After dropping her fall classes, Mae did not perceive a need to learn the speech recognition program.

Several factors under technology contributed to Mae's nonuse of the program. First, Mae believed she had outgrown the speech recognition program. She commented that she no longer needed the program after dropping classes. A second factor was time. Arranging for training sessions took numerous attempts over several months. The long delay contributed to abandonment. She acknowledged the training required a time commitment. Finally, other options existed. Mae had the ability to type, which is an alternative to dictating.

Mae's case demonstrates a clear example of abandonment. If Mae would decide to use the program in the future, interventions could be put in place to increase her success rate. For example, placing the computer in a location that creates privacy and a quieter environment might help.

According to the MPT model, Mark was a partial user (Appendix M). He had an environment conducive for using the speech recognition program. Not having a roommate allowed for the ease of using the program at his convenience.

Mark's personal characteristics contributed positively. His coping skills, patience, cooperative attitude, and computer skills aided him in using the program. While using the DNS program he acknowledged referencing the manual when he encountered difficulty, demonstrating problem-solving skills. During speech recognition training, Mark displayed patience when computer problems occurred. Mark also exhibited adequate computer skills when he connected his computer tower to the monitor and loaded the DNS7 software independently.

The program's ease of use and having no side effects such as fatigue or stress were positive aspects of the technology that contributed to the program being used. Mark never reported difficulty with the program during the year.

When the characteristics for the three factors, milieu, person, and technology are identified on the MPT model for Renee, the categories of optimal, partial/reluctant, and avoidance were revealed (Appendix N). Renee had support from her family; an optimal and desired situation. Renee reported her family would leave the room when she used the speech recognition program. Despite the family's support, Renee would have preferred the computer be located in a room that allowed for privacy.

Her characteristics ranged from optimal user to avoidance. Renee possessed several of the characteristics Scherer (1991) identified as ideal. These included patience, self-discipline, knowledge and skills to use the equipment, coping skills, and cooperation. Renee demonstrated self-discipline as she balanced school, work, family, and friends. Her computer skills were adequate as she used email for communication, demonstrated

ability to open and close programs, and created documents. Feeling uncomfortable dictating in front of others was a contributing factor to her limited use.

Renee fell into the partial user category under technology. She reported that using the speech recognition program was not difficult. However, she reported muscle strain because she sat more rigidly when dictating. Despite the positive factors indicating a positive match between the consumer and technology, other factors contributed to her limited implementation of the speech recognition software. Having alternatives such as a keyboard, and her individual characteristic contributed to her limited use.

When Travis's characteristics were plotted on the MPT model (Appendix O) he fell between the optimal and partial/reluctant categories. Both residence hall and apartment living allowed for easy access to his program. Travis either had a room to himself or considerate and understanding roommates who provided him with privacy as needed. These two factors are optimal when looking at the milieu.

Travis was not embarrassed to use the speech recognition program. He also had the knowledge and the ability to learn skills he needed to use the program.

Travis reported vocal and physical strain, as well as fatigue when using the speech program for extended amounts of time. Travis also complained about the several hours of training required to set up the program. These factors contributed to partial use. Travis did not, however, have any other technology options that allowed him to complete papers in an efficient manner. His alternative to speech recognition was finger poking or relying on someone else to type his paper while he dictated to them.

The MPT assessment model was used to analyze to what degree the participants used their speech recognition program or had truly abandoned the technology. Despite the positive indicators, Renee and Harvey did not use the speech recognition program very often as only one and two assignments were completed. Mark and Travis utilized the program to complete more than two assignments.

Within the participants living environment two factors were noted to impact speech recognition use. These two factors were the living arrangement and change in academic demands.

Living arrangement. For Travis, an environmental factor was noise. Noise within the environment influenced to a degree when he accessed his speech recognition program. Living in the residence hall, Travis explained certain times of the day were more conducive for dictation. He identified the evening, after dinner, to be a relatively quiet time. The lunch and dinner hours were not as conducive to dictating as groups of people could be heard talking as they walked down the hall. Travis noted periodically he would have to ask his neighbors to keep the noise level down and/or shut their door when their noise interfered with his speech recognition program.

Travis did not identify any noise affecting his use of the program while living in university apartments, despite the street traffic I heard. He noted his roommate spent the majority of his time on campus or in his room; therefore, there was only a limited amount of noise from his roommate. Noise within the apartment may not have been much of an interference with the speech recognition software, as the program was only used for training purposes. While living in a rental with two roommates during the summer, noise

influenced his use. During one observation, Travis stopped using the speech recognition program and typed his paper. He reported interference from the television in the other room. For Travis, the noise level in the environment influenced whether he was going to type or use his speech recognition program.

Change in academic demand and need. The second factor in participants' use of the speech recognition program was low academic demand and need for the program. As the participants' life changed, so did their use of the program.

Other responsibilities influenced Mae. Working and caring for a family member conflicted with other commitments. School appeared to be too much also as she dropped her classes. As her responsibilities changed, her commitment to completing speech recognition decreased. When not enrolled in school, Mae no longer perceived a need for the speech recognition program because she could type or write notes or lists. She never completed the process of creating a voice profile.

Mark encountered change as he accepted an internship. While he remained a student, the academic demand of going to class and completing course requirements were non-existent. During the spring semester, he said using his computer had decreased drastically and that he no longer utilized his speech recognition program because he did not have any papers to complete. He predicted that when he returned to school, using the speech recognition program would occur.

Renee and Harvey did not encounter any major changes. The only notable changes occurring for them were classes and course requirements. Class requirements

differed slightly and contributed to their limited use of their speech recognition programs to complete assignments.

Changes for Travis involved different housing, different classes, and friends moving out of state. For Travis, use of the program occurred when he completed training during the fall semester and had the program available to use during the spring semester.

As the academic school year progressed, the use of the speech program for three of the four participants declined from using the program a few times to not using the program at all, while one participant's use increased, as a result of training being completed. One of the five participants never began using the speech recognition software.

Research Question 4: How do students appear to benefit from speech programs?

Time efficiency. The participants identified saving time as a common benefit of the speech recognition program. Students perceived the program allowed them to complete their assignments at a faster rate, therefore, giving them more free time. Renee said using the program saved her time on projects that she had to complete. She identified a typing task that could have taken an hour could be completed in approximately 30 minutes with dictation.

Harvey agreed with Renee that the speech recognition program saved time as he identified the program cut down on his "paper producing time." This allowed him additional free-time for other activities.

Mark also expressed his belief that the program saved him time. He explained when he had a lot of typing to complete he used the speech recognition program and

could complete the task in half the time. Later, Mark shared how he had used his speech recognition program for an assignment and completed it faster than a classmate who took four hours to type his paper. Cutting the amount of time to complete assignments was an important benefit of the program. Mark also stated, “If it wasn’t for the speech recognition, I would probably have, probably doing a lot more homework.”

Students perceived the speech recognition program as a beneficial and efficient tool. Talking was perceived as faster than typing. While the participants alleged they saved time, the speech recognition program was not necessarily a time-efficient tool overall. Editing needs to be factored into the equation. Travis said the amount of time it took him to compose a paper had decreased, but the editing process remained a lengthy task because editing requires users to proofread carefully for mistakes, as substitutions, omissions, and insertions could occur. Proofing a document for incorrect, missing, or extra words can be more difficult than identifying misspelled words.

To judge if speech recognition programs assisted the students in their writing ability, a writing rubric was developed (Appendix G). Dictated text samples were collected from the participants during both the fall and spring semesters and scored using the writing rubric.

It became clear as the year progressed that scoring participants’ dictated writing samples was not an appropriate measure for all of the participants due to several factors I did not foresee prior to this study. For example, I had not considered students using the program to read prewritten text as Renee had demonstrated. Evaluating text that was not

the participant's original work would be an irrelevant measure of the student's writing ability. Therefore, the writing rubric was not applicable to Renee's dictated sample.

I discovered the writing rubric also was not applicable to Travis's assignments. It became clear that I could not use a rubric for the assignment I received from him because he only dictated the paper and used outside assistance for editing. Travis relied on his friends to assist in editing his papers. Having others proof one's papers is good practice and recommended in writing guidebooks (Sebranek, Meyer, & Kemper, 1989). The editing process for Travis resulted in numerous changes in sentence structure, punctuation, and vocabulary as friends corrected his paper. Run-on sentences I observed during dictation were not found in his final papers. The scoring of Travis's final papers would not be an accurate measure of improvement in his writing ability over time. I did obtain one paper prior to editing (Appendix J Sample 1). This paper consisted of run-on sentences and incorrect punctuation. The first paragraph of this paper read:

This movie deals with the last nine year of King George III reign as king, this movie starts five years after the loss of the American colonies form England, and deals with the Kings mental illness and the techniques that were used to make him better, it also shows the relationship between King George the Third and his son the Prince of Wales.

This writing sample demonstrates either a lack of writing and/or dictation skills or the complexity of composing through dictation. The run-on-sentence and incorrect punctuation usage signals a misunderstanding or a lack of punctuation rules. This sentence contains several different concepts as opposed to containing one thought. The majority of the commas in this sample should be periods.

This second writing sample was also taken from the same paper:

The next thing I wish to discuss is what they did to treat the king and his illness, one of the first things his doctors did was to remove him from Windsor Castle to a new location, along with removing the king they also wanted with the Prince of Wales help denied access to the king by the Queen and his younger children.

This example of a run-on sentence located within in his paper indicates lack of understanding of when to indicate the conclusion of a thought. The sentence contains several thoughts that require separation. Finally, a lack of precise writing is evident; for example, the phrase “treat the king and his illness” could be stated more concisely by saying, “treat the king’s illness.” These errors suggest lack of writing skills or indicate the complexity of dictation. Travis identified and demonstrated editing occurred after he finished dictating.

Use of the writing rubric for Harvey’s writing assignments showed no improvement from the first to the second writing sample. Harvey’s paper contained misspelled words and a few punctuation and capitalization errors. In addition, there was a lack of adequate explanation and support for ideas presented in the papers.

Mark’s writing samples revealed a few punctuation errors. Incorrect word use (i.e., *effected* for *affected*) and lack of explanation were noted in two of the writing samples. Improvement in writing skills was not observed as scores fluctuated. His work samples (Appendix I Samples 1, 2, 3, 5, 6, and 8) demonstrated the importance of editing. In sample one of Appendix I, answers one, three, and four contain incorrect words that result in unclear answers: “workfare”, “interment”, “other”, “look you in”, “slime tripping or home.” Careful proofing is required as words can be easily substituted and not identified by a spell checker. For example, the word “stairs” was replaced by “stir.”

As a result of the substitution errors not corrected, comprehending the meaning can be difficult.

Summary

The results of the case studies were presented in this chapter. Five participants' perceptions of speech recognition training and how they used the program over the course of one academic school year were investigated. Four of the five participants completed training and had continuous access to their speech recognition program. The students found the training process monotonous as a result of having to read stories for their voice profile. While four of the five students used their speech recognition programs for the purpose of completing course requirements, how they used their programs varied. Participants demonstrated using the program for dictation and for reading prewritten material to the program. Individual characteristics, environment, and the need for the program were influences of student use. Two of these influences, the person and environment, were two of the factors identified by the MPT model. A benefit of using the programs was similar to that identified in the current literature, decreasing the amount of time spent on academic tasks because dictating is faster than typing. While improvement in students' writing has been suggested in the literature, it was not evident in the writing samples of the participants in this study.

CHAPTER 5

CONCLUSIONS AND IMPLICATIONS

In this case study, five postsecondary students with learning challenges used speech recognition programs in their natural academic environments during one school year. The purpose of this research was to allow the perspectives and viewpoints of speech recognition users to emerge. The participants' voices were brought to the forefront by acquiring an understanding of how they used these programs. Specifically, the following questions were posed:

1. How do students with learning challenges perceive the speech recognition training process?
2. How do students utilize speech recognition programs for college academic demands over an extended period of time?
3. What are the positive and negative factors in the natural environments that affect students' utilization of speech recognition programs?
4. How do students appear to benefit from speech recognition programs?

The results of the study were presented in Chapter 4. Findings are summarized and implications for consumers, practitioners, and researchers are provided in this chapter.

Summary of Findings

A summary of the findings is presented below for each research question.

Research Question 1: How do students with learning challenges perceive the speech recognition training process?

The four students in this study who completed the speech recognition training described the process of creating a voice profile as boring, tedious, and time consuming. They liked this activity the least. One participant demonstrated off-task behaviors and avoidance of appointments, indicating the training process to be monotonous. Participants also mentioned the training process and traveling to the instruction site as time consuming. Travis expressed a lack of time to complete both course work and speech recognition training. The participants in Roberts and Stodden's (2005) study expressed similar feelings. They reported time was a variable and that maintaining their academics was the priority, not learning a new program. Participants indicated their willingness to learn the program if they had the time available (Roberts & Stodden, 2005).

Research Question 2: How do students utilize speech recognition programs for college academic demands over an extended period of time after training is completed?

Completion of academic assignments with the speech recognition program consisted of written papers (e.g., essay test, opinion paper), questions and answers, and activity projects (e.g., collection of poems). One of the participants explored using his speech recognition program for occasional use of non-academic activities: chatting on-line, emailing, and searching the Internet.

The type of dictation and correction procedures utilized by the participants varied. Both reading of prewritten material and spontaneous dictation were used to complete assignments. Renee identified reading of prewritten material to be easier. She would agree with the participants in Karat, Halverson, Horn, and Karat's (1999) study that it is easier to think and type than think and talk. To avoid extra text, Renee preferred having pre-written material, supporting Pogue's (2001) recommendation of having a complete sentence prepared before dictating so "babble" can be avoided.

Participants also spontaneously dictated. Mark reported forgetting his dictation and echoed Gardner (1980) who said, "I have difficulty in estimating the length of the material I've produced, in remembering the wording I've used, and in judging where paragraphs should begin and end (p. 17)." Travis also found estimating the length of the document while dictating and inserting punctuation a difficult task.

Despite the availability of voice correction commands, a few of the participants reverted to manual correction, as did the speech recognition users in Karat et al.'s (1999) study. Four of the participants perceived correcting errors manually an easier task. Renee expressed her familiarity with using the keyboard. She identified, as did the participants in the Karat et al. (1999) study, that the keyboard was more natural.

Renee and the other participants in this study reported the ease of correcting errors with the keyboard. These findings are consistent with those comments of Honeycutt (2003) who said, "keyboard editing is simply faster and easier than voice editing" (p. 83) as well as those of two participants in Roberts and Stodden's (2005) study, who reported, "they could get work done quicker just by typing rather than trying

to make corrections when using the software” (p. 55). Harvey, Renee, and Travis found manual correction prevented additional errors from occurring whereas the speech recognition program may misinterpret voice commands. As a result of errors, additional steps in the correction process must be performed. Using voice commands to correct errors has been documented to result in a multiple-step process for novice users (Halverson et al., 1999) as witnessed in this study. The participants in the Karat et al. (1999) study reported difficulty with correcting errors. This complexity may have influenced the participants’ perspective that error correction was faster with the keyboard, the program was prone to errors, and commands were not easy.

Research Question 3: Are there positive and negative factors affecting students’ utilization of the programs in the natural living environments?

Positive factors contributing to use of speech recognition programs within the home environment were not identified over the course of the academic school year, despite ideal conditions, such as privacy. Noise or knowing others were in the house discouraged use of the program, despite having privacy. Time of day also impacted utilization of the program, as more noise occurred during the dinner hours in the residential hallways.

A second influential factor in program use was the changes that occurred within participants’ lives. Responsibilities in or outside of the home impacted use of the program. This was evident as training and use of the speech recognition program never materialized for one of the participants due to her family and work obligations. In this study, the change in courses had a negative impact. Three of the participants reported not

having a reason to use the speech recognition program at one point during the study due to a lack of course assignments to complete. In addition, students had an alternative to work completion, favored their old method of composing written documents, and were familiar with the keyboard. Access to computers during the day and preference for typing limited the need to use speech recognition programs.

Research Question 4: In what ways do students appear to benefit from speech programs?

The speech recognition program was reported as a time efficient tool. Participants perceived completion of assignments to take less time. Speaking was noted to be faster than typing.

While academic benefits of speech recognition are documented in the literature (Higgins & Raskind, 2000; Raskind & Higgins, 1999), participants in this study did not demonstrate any of these benefits. The students did not perceive any improvement in their grades to occur as a result of using speech recognition. Mark said he did not notice any grade improvement; however, he did identify the ability to use vocabulary words he would otherwise avoid. Harvey stated his grades in college were the same as the grades he received prior to having access to the speech recognition program. Renee also expressed no difference in her grades as the program had been used for only one assignment.

In addition to students not reporting any academic changes, no visible growth in students' writing samples were noted. Academic and writing improvements were not observed due to the lack of a sufficient number of writing samples completed and received from each participant. Improved student academic performance may have

transpired if use of the speech recognition program for completion of other academic tasks had occurred. The number of course requirements completed using the speech recognition software was minimal and appeared not to impact course grades. Additional writing samples would have allowed for further comparison of students' writing and may have resulted in observable changes.

Implications

Keeping the limitations in mind and the participants' experiences and comments, the following implications seem practical and relevant for consumers, practitioners, and researchers. Each group has distinct issues that will be addressed separately in the following paragraphs.

Consumers

Prior to learning a speech recognition program, the user will need to evaluate their compatibility with the speech recognition program by responding honestly to the following four questions. The answers will assist in determining the appropriateness of the speech recognition tool for the individual.

1. Do I want to learn this program? If the response is yes, why? Am I learning the desired speech recognition program because others have instructed me or is this my decision? Learning the program requires internal self-motivation and obligation from the user. The individual will need to commit to several training appointments and have self-motivation to practice and use the program on their own.

2. Do I have the time to learn this program? What are my other obligations? Work, classes, studies, friends, and family responsibilities can consume many hours;

therefore, there may be little time for another commitment. Time is required for training and practicing the skills. This will allow for familiarity with the program and increase one's efficiency. Practicing will also improve one's accuracy rate as will reading additional stories for the voice profile. Travel time to and from the training site will need to be considered if the consumer will commute.

3. What function does this program serve? The program should serve a function for the consumer. For example, is the speech recognition program a cognitive prosthesis, that is, a piece of technology used to provide ability and assistance for an individual with an impairment (Cavalier, Ferretti, & Okolo, 1994)? Using the speech recognition program due to limited access to the computer will contribute to the program's use.

4. What are my expectations? Why do I want to use this program? Does the consumer expect the program to allow them to save time or assist in obtaining better grades? The user will need to identify what benefits he or she expects from using the program and have realistic expectations. The program's abilities and limitations should be identified for the user. The consumer should not anticipate miracles (Newman, 2000). If unrealistic expectations exist, realigning the potential outcomes will need to occur. For example, speech recognition programs will produce typed text; however, they will not eliminate the need for editing. The user should not expect the program to work immediately after its installation.

Practitioners

A number of factors need to be considered when recommending any piece of equipment. The assessment tool provided in Appendix P is designed to assist in the

avoidance of abandonment by gathering information during the decision-making process. Information is gathered from interviews with the consumer and educational professionals and from observations of the user. Each of the six sections of the assessment tool is briefly discussed.

General information. General information consists of the user's name, age, contact information, his or her grade level and current educational setting (high school or postsecondary), and the date information is gathered. This information will provide a general idea of the student's current educational status and determine appropriate software.

Major. Identification of a major allows for clarification of possible course requirements and if opportunities to use the program may exist. Academic requirements vary from major to major. For example, the education and training for some careers require more active and practical participation, while other majors consist of more written assignments, such as historical and technical reports, essays, summaries, and reflection papers. Considering a student's major assists in determining and selecting the appropriate speech recognition program, resulting in a task-technology fit (Goette 2000; Goette & Marchewka, 1994). Speech programs for some specific careers, such as the medical profession, can be purchased.

Future goals. By asking the student his or her future plans, one can begin to understand the purpose the speech recognition program may serve. If the user has plans to continue his or her education, it is assumed opportunities for writing will exist. Utilizing a speech recognition program may then be beneficial for the student. If the

consumer plans to enter the work force, the question becomes, what purpose will the speech recognition program serve? Will the student use the speech recognition program on the job site or within his or her home environment? Identifying existing opportunities for utilization assists in deciding appropriateness of the program for the student.

Recording future goals will aid in detecting which computer skills may be relevant and should be taught to the student. Discussion of the student's future plans regarding education and career will assist in determining how to structure the speech recognition sessions, allowing for individualized training. Training sessions should resemble the actual intended use of the program. Therefore, if the program will be used for surfing the Web, the student should learn and practice those techniques.

User's traits. An individual's traits contribute to their use of technology. The questions designed in this section of the assessment gathers five pieces of information. First, user's academic strengths and weaknesses in subject areas (e.g., math, reading, writing) and/or study skills (e.g., time management) are identified. A clear understanding of the student's academic strengths and weaknesses will assist in avoiding possible difficulties the student may encounter with the program. For example, reading difficulties may signal that the user will require assistance with the creation of his or her voice profile. In addition, assessing the student's writing ability will allow for any basic writing review to occur prior to utilization of the program, if required. Understanding punctuation rules will assist in preventing additional work for the user. For instance, adding periods while dictating automatically begins the next sentence with a capital

letter. Not dictating punctuation creates additional work by requiring the user to manually add the correct punctuation and capitalization.

The second piece of information gathered is the acknowledgement of any physical challenges of the student. Identifying user's limitations and abilities assist in considering any additional technology or assistance required. In addition, current modifications used by the consumer are revealed. This also indicates if a need for the program exists and if other technology alternatives are available for composing documents or accessing the computer.

The student's writing process is the third piece of information gathered. The collected data is used to design a program for teaching the student to use the speech recognition program for composing written text.

Fourth, the user's commitments are identified. Listing activities and the number of hours within a week (e.g., classes 15 hours, work 10 hours, studying 15 hours, volunteer 5 hours a week) for school, work, etc. allows for a realistic look at the time available to learn and practice using the program.

The fifth piece of information gathered is why the user desires to learn the speech recognition program. This information assists in identifying who wants the student to learn the program. This is important because one's motivational level contributes to the utilization or abandonment of assistive technology. Finally, determining the purpose the speech recognition program will serve and how the program will be utilized assists in determining skills that may need to be taught.

Environment. Selecting the setting in which the student will use the speech recognition program is crucial in identifying potential barriers needing to be dealt with in advance. As an example, extraneous noises within the environment can influence the student's use and the success of the program. The environment needs to be examined to determine if the noise can be controlled or limited. Other considerations include lighting, room temperature, and the moral and technical support available. In addition, familiarity with the surroundings will allow for creating a compatible speech recognition environment; for example, placing the computer in a location allowing for privacy helps students relax.

Technology experience. The consumer's experience with other assistive technology devices and how they currently use those tools are gathered. Acquiring this information will assist in matching the technology and user. This is accomplished by:

1. identifying additional skills the user may have, such as programming communication devices, connecting various devices to computers;
2. understanding their technology experiences;
3. naming possible barriers that need to be prevented; and
4. listing other devices that may be more suitable.

In addition, understanding why the devices are used or not will assist in identifying potential barriers.

Computer skills. Finally, the student should have basic computer knowledge. Several computer skills are outlined on the assessment tool (Appendix P), beginning with the basic skill of turning the computer on and progressing to toolbar use. Skills include

basic word processing skills (e.g., opening, saving, printing a document), which are required because speech recognition programs place dictation into a word processing document. Knowing how to save a document and use the other features located in the toolbar are beneficial as the word processing documents provided with the speech recognition programs are designed similar to other word processing documents, such as MS Word. Understanding how a word processing program works will greatly assist in the process of learning to control the computer by voice. Students who have not acquired a basic understanding of word processing will need to learn basic computing skills, as mentioned, and know how to attach accessories to a computer (Newman, 2000).

The factors identified above allow for individualized training. In addition, societal influences should be considered. Society may directly impact a student's use of speech recognition or any other piece of assistive technology. Society's acceptance influences how, what, and when technology is used. As an illustration, the cell phone, a recent technology gadget, has provided convenience to everyday life. Talking on a cell phone while standing in line at a store or while ordering at a fast food restaurant has become a common, albeit, annoying practice. While using a cell phone is socially acceptable, talking to one's computer is not.

The speech recognition training process can begin after the identification of a potential candidate, location, training time, and possible barriers. Training involves commitment of both the trainer and the user. Time is a critical factor as the user will need to create a voice profile, learn the commands, and practice using the program. The trainer will need to assist the user through the voice profile process, teach the various

commands and how to compose documents using a speech recognition program. The amount of time required for training is difficult to determine as individual factors, such as ability, knowledge, and level of commitment, influence the amount of training and practice required.

Researchers

There are several research questions that remain unanswered. These questions emerged during this study or were noted to be lacking in the literature. The following areas are recommendations to researchers as future investigation topics.

Participants. First, additional research is needed to answer the question, “Who benefits from using speech recognition programs?” Use of speech recognition software by persons of various ages and disabilities are two areas recommended for exploration. Investigation of young speech recognition users has occurred on a limited basis with preschool (Strommen & Frome, 1993), elementary (Holmes et al., 1985; MacArthur & Graham, 1987; Wetzel, 1996), and middle school children (De La Paz & Graham, 1997; Follansbee et al., 2000; O’Hare & McTear, 1999). Additional studies are required to investigate the success of the programs with young users, how they use the programs, and benefits of the programs. Further exploration with the latest software will assist in answering these questions and contribute to the existing studies that have investigated speech recognition software programs that are now outdated.

The second recommended area for investigation is the use of speech recognition programs by participants with various abilities. The majority of the literature has explored speech recognition programs utilized by individuals with learning disabilities

and language disorders, such as aphasia. Speech recognition programs have the potential to assist individuals with various other disabilities. Possible users include those with limited access to the keyboard.

Training. The second area recommended for study is when to expose and train speech recognition programs. The participants in this study acquired speech recognition training while enrolled in college. Would the participants have benefited from earlier experience with these programs? Renee identified familiarity with the program as an important factor by stating “the more you use it, experiment with it, you’re gonna get more comfortable.” She stated that exposure at a younger age may have increased her use of the program. Several times she stated that she grew up with computers; therefore, typing and using computers were comfortable and second nature to her. Renee added that if she had grown up with speech recognition programs, she probably would have used them more than she did. The cognitive age to which exposure to speech recognition programs is appropriate requires further study. Factors such as writing skills, keyboarding and computer skills, and language require investigation of when to teach speech recognition programs to children. A child’s development may influence when he or she should be exposed to speech recognition programs.

Tasks. A third area for further examination involves investigating various tasks that may be completed using speech recognition programs. The participants in this study used their speech recognition programs to complete course assignments consisting of various types of papers (i.e., opinion, essay, compare and contrast), projects (i.e., creating

various teaching files, song files, cooking files), and assignments (i.e., answers to text questions).

Writing papers was not the only course requirement of the participants. Other assignments included reading text, such as books or articles, writing lesson plans, creating academic units, and tests. Speech recognition programs can be used to assist students in meeting other academic requirements, such as preparing for an exam. The software can be used to take notes from textbooks. In addition to text notes, notes taken during class could be incorporated into the text notes to create a study guide. Finally, the program can be used to have the notes read to the user. Just as learning to compose through dictation requires training, students will need to be taught the skills for note taking. Students will also need to be assessed on their note-taking ability.

Another academic requirement is tests. For students who receive an accommodation of a scribe, an individual who writes for them, using speech recognition allows for independent test completion; therefore, eliminating dependence on others. MacArthur and Cavalier (2004) investigated speech recognition software as a test accommodation for high school students with and without learning disabilities. Additional research is needed, as their study indicated students produced better quality essays when dictating to a scribe, rather than a speech recognition program.

Speech recognition programs are designed as an alternative method of input. Any activity completed with a keyboard can be accomplished with dictation. Emailing, chatting on-line, and surfing the Internet are three nonacademic activities that are

potential areas of investigation. Finally, in addition to completing academic tasks, work-related demands are an area for further research.

Dictation process. A fourth area for investigation is the dictation process. First, planning techniques implemented when using a speech recognition program need to be understood. Specific dictation steps have not been identified. How should individuals dictate and what measures should occur before dictating are questions that remain to be answered. Case studies investigating the methods used prior to dictation will assist in designing an appropriate and teachable process for dictating. How the writing process interferes with dictation, or vice-versa, are areas in need of investigation. As students in this study indicated, composing verbally is a difficult task. The mechanics of writing and lack of understanding of writing rules may interfere and disrupt the writing of students (Graham, 1990). Further investigations are needed to understand the process of verbally composing.

Hartley, Sotto, and Pennebaker (2003) asked the questions, when do users switch from using one input to another for completion of a document? and how do writers use speech recognition software? These authors predicted some writers might use speech recognition software programs for completing longer tasks. In the present study, Travis demonstrated using manual input because oral input resulted in too many errors to correct. Renee mentioned during an interview preferring to use her speech recognition program to dictate long papers and to type short papers (one or two pages in length). Investigation of the type of input consumers use to complete a task requires further inquiry.

Environment. Exploration of speech recognition programs in various living and working environments is needed. Information should be obtained regarding environments conducive for speech recognition use. First, how does the environment impact consumer's use of the speech recognition program and how does the software affect others within the environment? Finally, how well does the speech recognition software perform in home and work environments with various noise levels and locations (i.e., private offices, open cubicles)? Further studies are required to understand these phenomena and the practicality of speech recognition programs implemented in all types of environments. For instance, this study was unable to investigate the impact of having a roommate in a small living environment, such as a residential hall room. Having a roommate may have an impact on a student's use.

Longitudinal studies. Finally, more longitudinal studies are needed for a deeper understanding of how writers use speech recognition programs over the course of several months or years. Usage of the program is influenced by several factors, which can and cannot be foreseen. As demonstrated by a few of the participants, personal changes in their lives impacted their usage of the speech recognition program. Other factors may contribute to a consumer's use of the program, such as the user's health or changes within the environment. Longitudinal studies are needed to explore the ever-changing situation of the user and their environment.

Another impact on one's use and experience is access. The students in this study had access to their speech recognition programs in their living environment. Exploring student's use of the program when it is more readily available, such as on a laptop is

another area of investigation. Two participants in this study identified completing their work at school, where they did not have access to their speech recognition program. If they had the program available in a secluded room, would they have used the program? With laptops being easily transportable, using speech recognition becomes much more accessible and enables additional work to be completed at one's convenience. Additional longitudinal studies are needed to answer these questions.

Conclusion

In this study, I explored users' perspectives on speech recognition software programs. Five postsecondary students with continuous access to speech recognition software used the programs at their discretion as a tool for meeting academic demands over the course of two semesters. Specifically, the goal of this study was to shed light on the practicality of speech recognition programs as a tool for meeting the academic demands of postsecondary institutions as perceived by consumers.

Four of the five participants completed the required speech recognition training and shared their perspectives regarding the time consuming training process. The students also expressed their preference for using keyboards for correcting errors rather than voice commands. The speech recognition software was used for spontaneous dictation and also for reading prepared text into the program. Environmental factors, such as noise, were noted to influence consumers' use of the speech recognition programs. Positive factors within the environment did not emerge. Participants were unaware of environmental factors that encouraged use of the speech technology. The personal benefits of the software students noted were saving time; course assignments

could be completed more quickly. The findings of this study suggest avenues for future investigations of speech recognition programs and the users' perceptions.

Speech recognition is one of many assistive technology tools available to assist students who have academic and/or physical challenges. While this software program may not be perfect, it holds great potential as an alternative device to the keyboard. Much of the literature to date has focused on academic benefits. In this study, the consumer's perspective was the emphasis. A consumer of assistive technology expressed their willingness to share information by stating, "I myself have suggestions for improvements if someone would just ask me." (p. 187, Scherer, 2005).

In this study, I had to deal with the unexpected problems of students who quit trying, changing circumstances for the program's use, unavailability of historical data, and questions that remain to be answered. My goal was to explore the consumers' perspectives of speech recognition programs. Through this research, I have tried to convey the experience and perceptions of five postsecondary students while leaving a trail for others to follow. The words of Elliot W. Eisner best summarize this research.

Education is about learning to deal with uncertainty and ambiguity. It is about learning to savor the quality of the journey. It is about inquiry and deliberation. It is about becoming critically minded and intellectually curious, and it is about learning how to frame and pursue your own educational aims (as cited in Sennett, 2004, p.2).

PARTICIPANT UPDATE

I would like to complete this research by providing a brief update of the participants in this study. Harvey remains living at home and completing his course work. He continues to work part-time; however, with a different restaurant employer.

During the fall of 2004, Mae and her mother moved to a smaller house within the same town. Mae lives with her mother and remains employed with the same company with whom she celebrated two years of service during the summer of 2005. Mae did not enroll in any classes during the 2004-2005 school year, but had plans to return to school during the fall of 2005.

Mark remains enrolled at the private liberal arts college and a member of the football team. He is currently a Residence Hall Assistant for the academic year 2005-2006.

Renee continues to work part-time. Her immediate plans are to graduate in December of 2005. She is exploring her options for continuing her education and obtaining a Bachelor's degree in education at a private liberal arts college.

At the end of the spring semester of 2005, Travis had surgery. He is currently living with a friend in an apartment and completing the previous spring's course work, in order to meet graduation requirements.

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Figure 1

Research Questions and Data Sources

Research Question	Data Sources
How do students with learning challenges perceive the speech recognition training process?	student interviews and observations
How do students utilize speech recognition programs for college academic demands over an extended period of time after training is completed?	interviews regarding student use and observations (videotaped)
What are the positive and negative factors that affect students' utilization of the programs in natural living environments?	observations (videotaped), field notes, and researchers journal
In what ways do students appear to benefit from speech programs?	writing samples (rubric) and the participants' self-perceptions

APPENDIX A
SCHERER'S MPT MODEL
ASSISTIVE TECHNOLOGY INFLUENCES

		Milieu	Person	Technology
U S E	Optimal	Support from family/peers employer Realistic expectations of family/employer Setting/environment fully supports and rewards use	Proud to use device Motivated Cooperative Optimistic Good coping skills Patient Self-disciplined Generally positive life experiences Has the skill to use the device Perceives discrepancy between desired & current situation	Goal achieved with no pain, fatigue or stress Compatible with /enhances the use of other technologies Is safe, reliable, easy to use and maintain Has the desired transportability No better options currently available
	Partial/ Reluctant	Pressure for use from either family/peers/employer Assistance often not available Setting/environment discourages use or makes use awkward	Embarrassed to use device Unmotivated Impatient/impulsive Unrealistic expectations Low self-esteem Somewhat intimidated by technology Technology partially or occasionally fits with lifestyle Deficits in skills needed for use	Goal not fully achieved or with discomfort/strain Requires a lot of set-up Interferes somewhat with the use of other technologies Device is inefficient Other options to device use exist
N O N U S E	Avoidance	Lack of support from either family/peers/employer Unrealistic expectations of others Assistance not available Setting/environment disallows or prevents use	Person doesn't want it Embarrassed to use device Depressed Unmotivated Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use Requires a lot of set-up Perceived or determined to be incompatible with the use of other technologies Too expensive Long delay for delivery Other options to device use exist
	Abandonment	Lack of support from either family/peers/employer Setting/environment discourages or makes use awkward Requires assistance that is not available	Embarrassed to use device Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies Has been outgrown Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX B
HUMAN SUBJECTS FORM

UNIVERSITY OF NORTHERN IOWA**HUMAN PARTICIPANTS REVIEW
INFORMED CONSENT****FOR PARTICIPANTS**

Project Title: "Speech Recognition: The Conceptualize Interpretation of Training and Using Speech Recognition Software By Postsecondary Students With Learning Challenges"

Name of Investigator(s): Delann Soenksen

You have been invited to participate in a research project conducted through the University of Northern Iowa. The University requires that you give your signed agreement to participate in this project. The following information is provided to help you made an informed decision whether or not to participate.

The purpose of this study is to explore speech recognition programs as an assistive technology tool. Two questions are asked. First, how effective are speech recognition programs as a tool for postsecondary students with learning challenges? Second, what do students think about using the speech recognition as an assistive technology tool?

If you wish to participate in this study, you will be trained to use a speech recognition program. Training will occur on the University of Northern Iowa campus and will consist of approximately ten 30-minute training sessions. After training is complete the program will be downloaded on your computer. You will have access to the program during the fall semester of 2003 and the spring semester of 2004. As the researcher I will conduct at least three face to face interviews to gain student's perspective regarding the ease of the program. Each interview will be occurring in the home or at the university and last approximately one hour each. I will also make a monthly visit for the purpose of observing your use of the program. These will also last approximately an hour. This research has the potential of benefiting students in obtaining technology and academic skills and in greatly promoting their learning.

As the investigator, I will maintain your confidentiality and anonymity by taking specific measures to prevent raw or processed data from being linked to you as participants. For example, I will not record any identifying information on any of the data. In addition, pseudo names will be used in place of your real name. Data obtained will be kept in a locked file and will be limited to myself and my dissertation committee. The information obtained in this study will result in a research paper that I am required to submit for completion of my educational program at the University of Northern Iowa.

Your participation in this project is entirely voluntary. You may choose not to participate or withdraw from the study at any time without repercussion of any kind. As

the investigator, I will be available to answer any questions you may have about your participation. I can be contacted at: (319) 273-3056. You may also contact my faculty advisor Dr. Sandra Alper at the Department of Special Education at University of Northern Iowa, (319) 273-6061. In addition, you may also contact the office of the Human Participants Coordinator, University of Northern Iowa, at 319-273-2748, for answers to questions about rights of research participants and the participant review process.

If you are willing to participate in this research project, please read the following statement and indicate your agreement by signing below.

I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.

(Signature of participant)

(Date)

(Printed name of participant)

(Signature of investigator)

(Date)

(Signature of advisor)

(Date)

APPENDIX C

INTERVIEW BEFORE TRAINING

Interview before training

Describe your computer experience. (Computer at home or school? What do you use the computer for? (games, papers, email, searching the web)

Explain to me what difficulties you have in school. (Physical challenges, academic difficulties).

How do you think speech recognition will help you?

APPENDIX D
INTERVIEW AFTER TRAINING

Interview after training

Now that you have received training, tell me what you think of the speech recognition program.

What did you find difficult about learning to use this speech recognition program?

What did you find easy about learning to use this speech recognition program?

APPENDIX E
MONTHLY FOLLOW-UP MEEETINGS

Monthly follow-up meetings
Have you used your speech recognition program since my last visit?

Yes	No
<p>What have you used it for?</p>	<p>Why have you not used the program?</p>
<p>What problems did you have?</p>	<p>What tasks have you done for which you could have used your speech recognition?</p>
<p>What did you like about using the speech recognition?</p>	<p>How can I help you to use the program?</p>
<p>What did you not like about using the program?</p>	<p>For what task do you think you could use the program?</p>

APPENDIX F
EXIT INTERVIEW

Exit interview

Tell me what you think of the speech recognition program that you have been using this semester.

In your own words, describe for me your experience learning the speech recognition program. Tell me what you think of the speech recognition training process?

Describe how you used the speech recognition program to meet the academic demands this semester?

What are the negative factors that affect your utilization of the speech recognition program in your living quarters (dorm, house)?

What are the positive factors that assist in your utilization of the program?

Describe how you benefited from having access to the speech recognition program this semester.

Describe how you feel you could have benefited from the program but did not?

Tell me what you think of the speech recognition program that you have been using.

Would you recommend that others with disabilities similar to yours use speech recognition programs? Why or why not?

What was the most difficult thing for you regarding the use of the speech recognition program?

Was there any thing else that was hard?

What was the easiest thing about using the speech recognition program?

What did you dislike most about the program?

What did you like most about the speech recognition program?

If you could change the program, how would you change it?

Do you think that you will continue to use the speech recognition program? Why or why not?

Do you see yourself using the speech recognition program in your future?

School?

Work?

At home?

APPENDIX G
WRITING RUBRIC

Writing Rubric

Student:

Sample Number:

Title of Paper:

Criteria	3	2	1	0
Organization	Well organized, complete thoughts, and ideas explained	Majority of thoughts and ideas are in order, with few ideas out of place, and majority of thoughts explained	Most of thoughts and ideas in order, with some jumping around and few explanations for ideas	Paragraphs and sentences are not in order and ideas not explained
Sentences	Sentences are complete and varied (in length and kind)	Majority of sentences are complete and varied (in length and kind)	Correct sentence structure with a lack of sentence variance	Does not write in complete sentences.
Vocabulary	Descriptive and specific words	Words that are appropriate for the topic	Over uses words	Uses immature and inappropriate language
Spelling and Grammar	Very few grammar and spelling errors	Some grammar and spelling errors	Grammar and spelling errors make it difficult to read	Many spelling and punctuation errors
Punctuation	Very few punctuation errors	Some punctuation errors	Many punctuation errors	Abundance of punctuation errors

Score:

Scored by:

APPENDIX H
HARVEY'S WRITING SAMPLES

Sample 1:

This paper is over a type of Technology that all hunters and gun shooters need to shoot a bullet. That technology is gunpowder. A lot of people that hunt need gunpowder to put in to blackpowdered guns and bullets.

Gun powder was discovered by the Chinese who had used this in firecrackers or fireworks. Gunpowder was probably introduced into Europe from the middle East. A German monk in the early 14th century may have been the first person to employ gunpowder for propelling a projectile. Whatever the precise dates and identities of its first discoverers and users, it is certain that gunpowder was manufactured in England in 1334 and that powder-manufacturing plants existed in Germany in 1340.

I wished I would have known about the history of gunpowder a long time ago just because I hunt with guns. I think gunpowder is a good Technology to come with or discover.

Sample 2:

One decision I made was to go out for a sport in high school. Well I had a little help from my parents with my decision, after they helped me a little I thought to my self and so I wanted to go out for Cross Country in my 9th gread year. Then I thought after Cross County was over I would go out for Track in the spring. Cause I thought Track would help me a little which it did help.

When I went and ran my 1st Cross County meet I liked to run. Some of my times I ran in cross country which is 3.1 miles. Some of my best time I ran were 19:20, 18:20, 17:51, and 17:44. So that spring I went out for track.

The next summer I ran in a running group called HILLTOPPERS RUNNING TEAM for high school kids. I ran on the traning team from my 10th to 12th grade year's.

APPENDIX I**MARK'S WRITING SAMPLES**

Sample 1:

Note: this is a question and answer assignment.

1. During the dry season the Yanomamo still conducted intervillage workfare.
2. Most of the fighting within the village stems from sexual affairs or failure to deliver a promised woman or out and out seizure of a married woman by some other man.
3. The Yanomamo can be difficult people to live with at times.
The Ye' kwana are very pleasant interment, all of them anxious to help me an honor bound to show any visitor the numerous courtesies of their system of etiquette.
4. Chagnon saw a dozen blurry, naked, sweaty, hideous men staring down at them down the shafts other drawn arrow. Immense wads of green tobacco were stuck between the lower teeth and lips making them look you in more hideous, and stands of dark green slime tripping or home from there nostrils. They had strands so long that they clung to their pectoral muscles or drizzled down their chins.
5. An example of the conditions that he ate meals was that of how he made oatmeal. First, he made two trips to the river to haul the water. Next, he tried to prime the kerosene stove with alcohol to get it to burn. The alcohol prime always burned out before he could turn the kerosene on and would have to start all over.
6. Chagnon withdrew his knife and cut each of their canoes loose. Then he sent their canoes into the strong current of the Orinoco River where they were merely swept up and carry downstream.
7. Chagnon's bubble busted because when he was chatting with the local headman of a village he casually dropped the name of the Bisaasi-teri headman. Then stunned silence followed, and then a village wide roar of uncontrollable laughter, choking, gasping, and howling followed.
8. Chagnon knew that he would be in very serious trouble if he got the village and said her name aloud. Chagnon desperately wanted to move it from the list.
9. The most important event of Chagnon's first 15 months was when Kaobawa showed up at his hut one day after all others have left. He agreed to volunteer to help with the genealogies. Kaobawa was poor as he explains that he needed a machete. He would work only on the condition that Chagnon did not ask him about his own parents and other very close kinsmen who had died. He also added that he would not lie to me as the others had done in the past.

10. Chagnon thought that Rerebawa is fierce and capable of considerable nastiness, he has a charming, witty side as well. Rerebawa can entertain the group for hours with jokes and clever manipulations of language. Rerebawa is one of the few Yanomamo that Chagnon feels he can trust.

Sample 2:

Note: This is a question and answer assignment.

1. He challenged the assumption that talking in an indirect way necessarily reveals powerlessness, lack of self-confidence or anything else about the character of the speaker.
2. The two extremes of getting people to do things are bald commands and the other is issuing orders indirectly can be the prerogative of those in power.
3. That directness is logical and aligned with power while indirectness is akin to dishonesty and reflects subservience.
4. The man was in the superior position. Yet when he addressed the woman, he frequently used polite language and almost always used indirectness.
5. He discovered when meeting in a neighborhood youth program all the officials spoke in ways that reflected their place in the hierarchy.
6. The person is offended when they come unadorned.
7. The co-pilot repeatedly called attention to dangerous conditions, but the captain didn't get the message.
8. They both were expressing their concerns indirectly, and the captains didn't pick up on it with tragic results.
9. The ethics of a culture in which silence is often given greater value than speech, and ideas are believed to be best communicated without being explicitly stated.
10. Empathy, this has to do with Japanese communication because I should not be necessary to state one's meaning explicitly; people should be able to sense each other's meaning intuitively.

Sample 3:

Note: This is a question and answer assignment.

1. The problem wasn't that we had paid too much; it was that we had paid at all.
2. If we wanted watermelons, or bananas, or anything else, all that as necessary was to let him know.
3. Made gifts, usually of tobacco to the adults or chewing gun to the children.
4. We had acquiesced in playing it - no one was permitted to sell us anything, and in turn we only gave things away, refusing under any circumstances to sell tobacco (or anything else) for money.
5. What was wrong with those bananas? Were they no good? Rogi had insisted that we shouldn't be worried about taking the bananas, because they were a fig for the children and Rogi hadn't wanted anything for them. There was no reason, he added, to send her away with them-she would be ashamed.
6. His last words to us before he went down the stir and stalked away ere just what we were by that time afraid they might be. "When your guests are hungry, feed them bananas!"
7. Our friends expected us to com "home" when we had leave, but knew that our work kept us away for long periods of time. They also credited us with knowing much more about the rules of their way of life than was our due. And we sometimes shared the delusion that we understood life in the village, but even fifteen years was not long enough to relieve the need for lessons in learning to live within the rules of gift exchange.
8. Our reciprocity in the village was balanced. More was given to those who helped us the most, while we gave assistance or donations of small items even to those who were not close or helpful.
9. Sara was the eldest of a group of siblings and her younger brother and sister were both generous, informative, and delightful persons. First, we noted the many times come to get things. We didn't mind sharing things, we explained. After all, we had plenty of tobacco and soap and rice and such, and most of it was there so that we could help our friends as they helped us, with folktales, information, or even gifts of food. The problem was that she kept coming to get things, but never came to talk, or to tell stories, or to bring some little something that the kids might like. "Look," we suggested, "it doesn't have to be much, and we don't mind giving you things-but you can help us. The kids like pineapples, and we don't have any-the next time you need something, bring something-like maybe a pineapple."
10. Marry, one of our best friends for years, dropped by for a visit. She said' "my father was waiting until it was fully ripe to harvest it for you, but when it went missing I thought maybe it was the one you had here. I'm glad to see you got it. I thought maybe a thief had eaten it in the bush."

Sample 4:

Note: This is a question and answer assignment.

Mystique of the Masai

1. That all the cattle on earth are theirs, that they were put there for them by Ngai, who is the god of both heaven and earth, existing also in the rains which bring the precious grass to feed the cattle.
2. The milk and blood to drink, and the meat feast when permitted.
3. The children enjoy their early years as coddled and adored love objects. They are raised communally, with great affection.
4. It determines the role the boy will play throughout his life, as leader or follower. How he conducts himself during circumcision is keenly observed by all; a boy who cries out during the painful operation is branded a coward and shunned for a long time; his mother is disgraced. A boy who is brave and who led an exemplary life, becomes the leader of his age-group.
5. A time of life that expresses the essence of the Masai – bravery, willingness to defend their people and their cattle against all threats, confidence to go out on cattle raids to increase their own herds, and ability to stand up the threats even from Europeans, whose superior weapons subdued the Masai but never subjugated them.
6. Both colonial governments and independent black-ruled governments have tampered with this social process, and have been successful in reducing the time men spend as warriors. By forcing this change, the governments hope to mold the Masai male into more tractable citizen, especially by forbidding such disruptive activities as lion killing and cattle raiding.
7. Because morani do not marry until they are elevated to elderhood, girls must accept husbands who are easily twice their age.
8. They compared school to death or enslavement. If children did go to school, they would be lost to the Masai community
9. The traditional Masai way of life has been under attack ever since. The colonial British governments of Kenya and Tanzania outlawed Masai cattle raiding and tried to stifle the initiation ceremony.
10. The Tanzanian Masai, still occasionally in animal skins, decorated with beading. The Kenyan Masai dress almost entirely in cloth, reserving skins for ceremonial occasions.

Sample 5:

Note: This is a question and answer assignment.

1. They are a North American group living in the territory between the Canadian Cree, the Yaqui and the Tarahumare of Mexico, and the Carib and Arawk of the Antilles.
2. Nacurena culture is characterized by a highly developed market economy which has evolved in a rich natural habitat. While much of the people's time devoted to economic pursuits, a large part of the fruits of these labors and considerable portion of the day are spent in ritual activity. The focus of this activity is the human body, the appearance and health of which loom as a dominant concern in the ethos of the people. While such a concern is certainly not unusual, its ceremonial aspects and associated philosophy are unique.
3. Every household has one or more shrines devoted to this purpose. The more powerful individuals in the society have several shrines in their houses and, in fact, the opulence of a house is offer referred to in terms of the number of such ritual centers it possesses.
4. This rite involves a practice which strikes the uninitiated stranger as revolting. It is reported to me that the ritual consists of inserting a small bundle of hog hairs into the mouth, along with certain magical powders, and then moving the bundle in a highly formalized series of gestures.
5. The holy-mouth-man opens the client's mouth and, using tools, enlarges any holes which decay may have created in the teeth. Magical materials are put into these holes. If there areno naturally occurring holes. If there are no naturally occurring holes in the teeth, large sections of one or more teeth are gouged out so that the supernatural substance can be applied.
6. The more elaborate ceremonies required to treat very sick patients can only be performed at this temple.
7. The latipso ceremonies are so harsh that it is phenomenal that a fair proportion of the really sick natives who enter the temple ever recover. Small children whose indoctrination is still incomplete have been know to resist attempts to take them to the temple because"that is where you go to die."
8. A witch-doctor has the power to exorcise the devils that lodge in the heads of people who have been bewitched.
9. Miner concludes about the certain practices which have their base in native esthetics but which depend upon the pervasive aversion to the natural body and its functions.
10. That they have a lot of belief about the human mouth and what happens to their teeth can be bad luck for them. Their teeth will fall out and gums will bleed and that they will have bad luck and all of their loved ones will leave them.

Sample 6:

What About “Female Genital Mutilation”?

The purpose of the GFM is transforming the female into someone that can be married. This type of ceremonies have been in place of cultures for years and it is something that the women look forward to so that they are married and in the Masai the women are able to look after the cattle that her husband tells her to look after and then she can pass it on to her son when he is old enough and when he gets to elderhood. This is looked around the world as something that is nasty and that it should be stopped. When talking about it people have brought out the rage in others. Female Genital Mutilation doesn't happen in every culture in Africa.

A example is that “circumcision is customary for the Konon of Sierra Leone, but for the Wolof of Senegal it is not. For women within these groups, one key factor—their culture affiliation—trumps other predictors of behavior, such as educational level or socioeconomic status.” (p. 146) So it just shows that you may not be in a female circumcision type of culture but you still do have other things in the culture that you have to for a women be different as a male. As if in many circumcision cultures you are looked toward the side that you are pure because you have the circumcision like the male.

Sample 7:

It Takes a Village Healer

There is a plaguing illness that is taking Africa by storm...AIDS. Many people think that they should help stop the spreading of the illness so that the people and the continent as a whole do not die out. There are many different views about how to stop the spreading of this illness, but to this day none have really been given a chance to succeed.

In this article it talks about some ideas and programs that have been put into place to stop the AIDS and HIV breakouts in Africa. People are trying to drop the percentage rates of people that have these diseases in Africa. There are currently traditional healers that believe that have the abilities to cure the disease, but no major studies have been done.

First, the article talks about Dr. Kokou Coco Tougji-Bandje, an African Healer. He found a plant called hetsi which Tougji-Bandje calls Tobaccoak. He believes that it destroys HIV in the blood. It goes on to say that Tougji-Bandje goes to the Africa development Forum. This is where they talk about strategies which will help lower the AIDS percentage in people in Africa.

Second, it talks about medical anthropologist named Edward C. Green who talks about combining the tradition herbal healers and Modern Medicine together to fight the AIDS illness. Green wrote a book called *AIDS and STDs in Africa: Bridging the Gap Between Traditional Healing and Modern Medicine*. In Green's book he points out, "instead of ignoring them (traditional healers), doctors and health educators should view them as an untapped resource," (pg. 162).

AIDS is taking over the country of Africa at a storming rate. The people are ashamed and in denial of what the disease has done to their country. "The victims don't cry out. Families recoil in shame. Leaders shirk responsibility. Denial cannot keep the virus at bay," (McGeary). People who are effected with this disease become outcasts, and people who try to use protection are hurt. "At another house, the wife was branded a whore when she asked her husband to use a condom, beaten silly and thrown into the streets," (McGeary).

AIDS in Africa is nothing like it is in the United States. In Africa people are infected all the time, and most don't even know it. There are no testing facilities and no medicines to help fight the disease. "We have no medicines for AIDS. So many hospitals tell them, you've got AIDS. We can't help you. Go home and die," (McGeary).

The people in Africa are not stepping up the plate and trying to solve their problem. "Ignorance about AIDS remains profound," (McGeary). Some people even believe that people are dying because of witchcraft, that maybe they did something wrong and they now deserve to die. This AIDS epidemic will not get better until people can face what IS in front of them and take some steps to get the disease under control.

McGeary, Johanna. Death Stalks a Continent. Time magazine: 2001.

Sample 8:

Summary of class' community service project

For our class community service project we went out to the lake and went to clean up the area around it. My group walked around and found that there was not much to pick up. We went to the dock and walked across it to see if there was any junk in the water to pick out; and found a guy fishing. This guy had overheard Franz talking about fishing and joined our conversation. True, I think the only garbage we had in our bag was the garbage that we had from eating suckers. But overall the experience was quite fun, plus drive was worth it since it was a beautiful day outside.

Sample 9:

Let Your Life Speak; Listening for the Voice of vocation

I find that for me this book talks about a lot of the things that I will be looking forward to as I grow up. The book prepares me for what is coming up in my life as I become a man.

This book really stresses responsibility. I think one thing that it stresses with responsibility is just doing what you need to get done in life. If you promise to do something or show up for something that you do it or hold true to your word. This is so that people believe you when you do give your word to someone and they believe you.

For example, if you say that you will be coming to Christmas dinner and that you will bring the deserts for everyone. You show up on time and most likely early and see where you can put the deserts and if you can help them with something else. After a while, people will believe you and might start giving you more responsibilities with other foods. This means that they value your promises.

In conclusion, I think this book has shown me what I should look forward to as I end my career at college and enter the job world. I will have to prove to bosses and employees that I am worth keeping around and that if I say that I will have something done by a certain time, I will be trusted to have it done and that it will be a great job. Therefore, they don't regret that they gave me that opportunity.

Sample 10:

Note: This paper Mark dictated and left editing to his girlfriend.

-“The universal appeal of the Cinderella story reflects people’s widespread embracement of folklore through the ages and across cultures” (Galda & Cullinana 127).

Cinderella was one of the stories that I was brought up on. Every child can remember hearing the famous story of Cinderella. I can only imagine that Cinderella is in virtually every culture. The story is important for children to know, because of the moral value in which it offers. I look forward to the day in which I will be able to tell the story to my own children.

-“Folklore is a rich source of literature for children. In the same way it explained the world to early people, it helps children today understand their world. Preschool children often believe that magic accounts for the things they do not understand” (Galda & Cullinana 128).

I had never really looked at the option of children learning about their world from folklore. After I really thought about it folklore can teach so much to children, and people at any age. There are folklore stories that can teach everything that a child needs to know about his/her world.

As far as the magic side of folklore children are able to imagine anything. Magic forces children to use their imagination to help understand stories. I think that magic is a wonderful tool to help teach children, and to help them learn too.

-“Researchers Maclean, Bryant, Bradley, and Crossland (1989) show that exposure to nursery rhymes improves children’s phonological skills and thereby their later reading ability” (Galda and Cullinana 131).

This statement is a bit surprising to me. I had never imagined that just by listening to nursery rhymes children’s reading abilities can be improved. If this research is correct we have found such a simple tool to help children improve their reading skills at such a young age.

-“Folklore began as stories and poems told across the generations, as people sought to explain natural phenomena and transmit cultural values. Folklore helps us to understand ourselves and people from other cultures” (Galda and Cullinana 149).

I really enjoy folklore stories that explain things such as why the sun shines, or why the earth is round. It is stories like this that can also help children to understand things that really are unexplainable. These stories are also so important to certain cultures that it is good to expose children to folklore stories.

APPENDIX J

TRAVIS'S WRITING SAMPLES

Sample 1:

Note: This is a copy of his paper prior to editing.

A movie review of the madness of King George

This movie deals with the last nine years of King George III reign as king, this movie starts five years after the loss of the American colonies from England, and deals with the Kings mental illness and the techniques that were used to make him better, it also shows the relationship between King George the Third and his son the Prince of Wales.

The first thing I will discuss is some of the activities that the King engaged in to make his prime minister and others think that he was ill, they include such things as running around Windsor Castle in nothing but his evening night gown while having his manservant chasing him and signing songs, we would also be caught talking to himself while no one else was there, along with his mental problems the king was also suffering from a physical problems as all, such as his urine was blue and he would double over in stomach pain. The king George's third also had a very sharp tongue and was well known for not Holdings it and saying inappropriate comments about other people around him these were some of the Kings and illnesses.

The next thing I wish to discuss is what they did to treat the king and his illness, one of the first things his doctors did was to remove him from Windsor Castle to a new location, along with removing the king they also want with the Prince of Wales help denied access to the king by the Queen and his younger children. While the king was at this new location the Prime Minister's hired a man by the name of Dr. Wilson which is told to him by Lady Pembroke who had used Dr. Wilson to help cure her mother from a mental illness. So prime Minister pit took Lady Pembroke advice and hired Dr. Wilson because he felt that the king's doctors were not able to diagnose and deal with the king's illness. Dr. Wilson used such techniques as a blistering of the skin restraining and strapping the King down so that he could not move or talk, Dr. Wilson would use these techniques on the king when he felt that the King was out of order either physically or verbally, he would also use this method when the king refused to do what the doctor asked. One of the main techniques I said Dr. Wilson using on the king in this movie was the simple technique of making the king a regular man instead of treating him like a king for example you were not supposed to look the King in the eye Dr. Wilson would look him in the eye he treated the king as a regular individual and not royalty.

While Dr. Wilson was trying to heal the king from his madness, Prime Minister Pitt was turning to save the King throne from his son the Prince of Whales, who was gaining enough support in the parliament to have a bill written up to make him Regent of England and take the power and control of government away from his father King George the Third and had gone close to doing just that he had gained enough support to have his father put under the care of Dr. Wilson and moved out of Windsor Castle, so in

effect he was willing England he just needed the parliament's consent to make it legal, but just before that vote could take place took the bill to the Queen the Queen in turn got permission to see her husband and showed the bill to King George, Georgia is able to read the bill and Dr. Wilson released him from his prison and let him go back to Windsor Castle and parliament just before the vote could take place as a consequence the King was able to get his throne back, and with that is power another thing the king did after his return was to dissolve the Prince of Wales marriage because it was illegal on the grounds that the king never gave his permission and also because his son married a Catholic which is against the law of Britain.

In the and end it was believed that Georgia the third suffered from a condition that affected the nerves called porphyria which caused the coloration of his urine and his mental problems, this disease is also hereditary.

Sample 2:

Note: This is a copy of his paper after the editing process.

Midterm essay question: England since 1688

Question 3:

Discusses the impact of the Industrial Revolution on English society. How does industrialization change working conditions and the status of workers? How does it affect living conditions and morality, according to Engels? How does labor resist and attempt to improve their conditions? What demands do they make? How successful are they?

The first issue I will discuss is what impact the Industrial Revolution had on English society. Before the Industrial Revolution English society was based on an Aquarian type of system, which means people did not live in cities but lived in the countryside. They also had to grow and make everything that they ate or wore; this means the family tried to be self-sufficient and did not need to rely on others. With that being said the problem with this system was the farmers did not own their land, it was in the hands of British nobleman so the tenet farmers would have to pay them taxes for the use of the land. The taxes would usually come in the form of money and food, meaning that the farmer would have to pay the landowner so much of the crop he raised that year and possibly what little money he had saved. This payment does not include the taxes the tenant farmer had to pay the church and state. By the time the farmer got done paying all these forms of taxes, he was left with very little money or food for his own family to live on for the year.

Also before the Industrial Revolution, goods were made in house or what got to be known as the cottage system, which means individuals made their own goods instead of buying them from a store or factory. Leaving them with a workable skill and away to make an income, alongside of their farming. This all changes with the rise of the Industrial Revolution and this is what we will discuss in the rest of this essay.

The first major change we see in England with the rise of the Industrial Revolution is the population moves from the countryside into the city. This has two major effects on England; the first is the cities cannot keep up with the growth of the population. The second major effect on England was it caused them to build poorly constructed housing, so they have a place to put all these new workers from the factories. But because of how badly these houses were built, they very rarely lasted 40 years after being built most of the time they fell down or were in ruins only after 20 years. Along with the moving of the English population from the countryside to the city, a middle class was created. A middle class was something England had never experienced before that time and led to many other changes during the Industrial Revolution.

The next thing I wish to discuss is the working conditions in factories during the Industrial Revolution. These conditions were utterly, awful and were not fit for man, women or child. The first of these problems were the hours the factory owners had their employees working. This was done without a break and usually in a standing or leaning position for twelve to fifteen hours at a time. Along with the long hours, the factory was not ventilated properly and would cause the employees to have numerous health problems such as asthma, or T.B. Other health concerns were poor posture; bad hygiene

and lack of proper waste removal just to name a few. Now that I have looked at the health issues facing the factory employee, I would now like to look at the sheer bodily danger a factory employee faced daily during the Industrial Revolution. When a factory employee woke up and went to work in the morning they were not only risking their health, but also their life due to the type of machinery used. It was not uncommon for an employee to lose an appendage causing the employee to be dismissed permanently. There were also cases of factory employees falling into the machinery and losing their lives, and when this happened it was rare for the factory owner to compensate the family for their loss of income.

Now that we have looked at what the Industrial Revolution did to the countryside and cities of Victorian England, and also how the factories treated their employees. I would now like to take a moment and look at what the Industrial revolution did to the family structure and morals of English society in further detail. First let's look at the family structure of the middle class, the Industrial Revolution had a major affect on the family structure of the working class in England. It took both the mother and father out of the home and put them to work in the factory leaving the children at home to fend for themselves. In other cases through, it was the mother who would go to work and the father who would stay home because he could not find a job, this was looked down upon in British society because it was the opposite of how it was supposed to be done. There are still two more scenarios that could of played out in the middle class working home. One being, that both parents had to work so they left their children in the hands of a neighbor or friend whom they paid to take care of their children. The second scenario is

the financial situation was so bad at home that the whole family could have had to work in the factory. These were the different options left to a middle-class family in England at this time.

Now that we've looked at the different options available to the family, let's take look at the affects these options had on the family, first of all the family very rarely ever got to see each other, due to the long hours they all worked. Secondly the children very rarely got an education and when they did they were either too tired to stay awake during class due to the long hours of work at the factory. Also the teachers were not educated enough to teach, so in the end the education system was almost worthless.

Now that we have taken a look at some of the affects the Industrial Revolution had on the family structure, let's take a close look at what it did for the morality of England. To put it bluntly it took morality and put it down the toilet, I can say this because during the Industrial revolution there were many cases of illegitimate children due to how close men and women work together. There were also many cases of alcoholism's and theft, this happened because the factory employee did not like this job or lots of times he did not make enough money to support his family, so he would turn to sex and drinking to drown his sorrows and his problems. During this time the employee also came under fire from other employees due to his nationality such as the Irish were looked down upon as weak, stupid and dumb just because they were Irish so along with the problems of morality, there is also social racism.

Now that we have looked at the problems facing the working class in England, in the home and in the factory, let's take a look at how the employees resisted these

conditions and tried to change them. The working class of England tried to change the condition in which they worked in many ways, some used sabotage, strikes and/or work stoppages. Others still tried to make changes by forming unions and changing laws and yet others used violence. These many different methods had varying degrees of success, let's first look at sabotage, this method while it did damage and slowed down production in the factory it was not looked upon as the best method. All it seemed to do was make the factory owners mad and punish the employee either by docking their pay or being fired from their jobs. The next method used was unions and strikes, this method also had many different degrees of success, as a first it was illegal for employees to form unions and/or even strike. But after happening numerous times in the factory owners finally paid attention to its workers and it also got the British Parliament involved. It got the Parliament to create committees to go in and look at the conditions these employees were working and living in. It is also true that the factory owners pulled the wool over the eyes of the government and that the government was slow to react to this, but in the end the workers started to get some concessions such as a 10 hour workday, women and children could only work eight hours a day and the government started to put in some health laws and building codes. The government also made other concessions such as it is OK to create unions and to gather together as a group.

In closing I think Engels would say that yes the workers were successful on a small level but has a long way to go. The industrial revolution while good for England financially, it was not good for the middle-class and the people that make up the middle class, because it destroyed lives, families and the morality of England itself.

Sample 3:

Note: This is a copy of his paper after the editing process

Part Two- final exam for England since 1688

Essay Two: compare and contrast the works you read by Robert Graves and George Orwell. What is similar and different in the backgrounds and education? What experiences do they have as soldiers? How do they understand the wars they fought in and the causes they fought for? How do they view media coverage of the war and the home front? Why did they write the material you read?

The first topic discussed is the educations of Robert Graves and George Orwell, and how they are the same but also different. Graves came from a half-German background. His family was higher middle-class due to his father having been a well-known writer, and also active in writing-circles. Graves began to attend school when he was 12. He attended Charterhouse School, and found life difficult to deal with at the school because of many reasons. First, the food was very poor in quality and quantity. Secondly, he had no communication with his parents or siblings while he was at school. Thirdly, Graves had to learn to deal with upperclassmen because it was those gentlemen that dealt out the punishment when lower classmen broke the rules, and at times those punishments could be quite harsh. There was also the issue of homosexuality. While this was against the rules of Charterhouse School, it still occurred in secret and Graves was no exception. He ended up having a relationship with an underclassmen by the name of Dick. While this was not only taboo, it is also breaking an unspoken rule – you did not

hang out with anybody else unless they were of your rank. To deal with the pressures of the English school system, and specifically Charterhouse, Graves took up boxing. He also joined a literary circle with his friend Dick. Graves always had an interest in writing because that was his father's occupation, so he always had access to books.

Now, let us take a look at George Orwell's education to see how it compares and contrasts with that of Robert Graves. The first difference we notice is that Orwell was of the lower middle class, which qualified him for a scholarship at Cross Gate School. As a result, his teachers, classmates, the headmaster, and headmistress looked down upon him. Unlike Graves, Orwell started his education at Cross Gate at the age of eight, but that is where the differences end. Just like Grave's school, Orwell's school served very poor food, and just enough to survive – the school authorities thought that this built character. Not helping the situation, Orwell's family was poor so they did not have the money to send Orwell to make his life better at Cross Gate. Orwell was also kept away from his parents and had little contact with them during his school years just like Grave's. Another similarity that Orwell's school shared with Grave's school was that the discipline of the younger children was handled by the upperclassmen. At Cross Gate School the discipline was handled by a group called the 6th, and just like at Grave's school the punishment that was dealt out was usually harsh. Another commonality between Grave's and Orwell's school was the issue of homosexuals. And, just like Charter House, it was also illegal at Crossgate, but it still happened even with the same set of rules. Unlike Graves, Orwell chose not to participate in such actions he knew existed. However, he was accused of the act of masturbation due to the fact that he had

dark circles under his eyes. He was also beaten because of his act of continuous bedwetting. So, as we can see, through this compare and contrast of their educational backgrounds, there are quite a few similarities but also a few differences.

The next topic to be discussed is the military careers of both Graves and Orwell, respectively. Graves served in World War II, and came in as a lieutenant. His mother thought he was mad for joining the war effort, but his father was proud that his son was going to serve and protect his country, England, from the Germans. His mother was worried because her son's half-German background might end up being a point of contention for Graves later on in his military career, and she was right. His first assignment was guarding war prisoners, which he didn't see as being heroic because when Graves joined the military he was ready to kill some Germans – he did not see guard duty as helping with the war. Graves wished to be on the western front with his buddies, but kept getting denied front-line duty by his commanding officer for being a lackluster soldier and unkempt in uniform. Graves did not feel that he could write his parents and ask for money to get a new uniform, because he told them in another letter that he is doing fine – he did not want to worry his parents. Eventually, Graves was sent to the front just as he wanted to be, but when he got there he soon became disenfranchised with the war. It is now that the war became real to him and he was able to see the deaths of his classmates and fiends. Also, at that time, Graves saw the inadequacies of the military. His main complaint was that those who were in high command, and in charge of the war, were oblivious to what was really happening on the front lines due to the fact that they were never there. They just saw the front-line soldiers

as chessboard pawns to be moved around and positioned. They did not see the horrible living conditions that the troops were living in, they did not have the bad food that the troops had to eat, and they didn't have to watch the horrors of war with their own eyes. But, while Graves hated the high command, he did have something good to say about the Catholic priests who served in the war. He noticed that they were not afraid to go to the front, pray with the troops, and comfort them as needed. In Grave's eyes, the priests were highly respected. Graves hated the war (near the end), but there's one thing he hated more. That was going home and being paraded around high society in his military uniform, which made him feel foolish. He also hated feeling out of touch with England. He felt that England was out of touch with the war due to the propaganda led by the newspapers. The only stories the English saw were victories of the battles, which were sometimes real, and sometimes made up. Most English people never knew of the atrocities of war like lost limbs, and deaths of best friends or family members. By the time the war was over, Graves had risen to the rank of colonel. Eventually, he got to go back home to England, but the shock of war remained with him for many years afterwards. For instance, if he was walking up the hill, he was trying to find where the best place to position the guns would be. If a car backfired, he would hit the ground, and, even once, he was caught stripping in a railroad station. Graves ended up thinking the war was useless, painful, and a loss of good life that would haunt him for the majority of his life.

Now, let us take a look at the military career of George Orwell. Orwell served in the Spanish Civil War as a specialist. Orwell had a different view of the

military; he thought that all orders given should be followed to the letter without question. Orwell also thought that the relationship between officers and enlisted men should be one of superiority and inferiority. Orwell, like Graves, started out gun-ho for the war. But as the war progressed, he too began to find faults with the ideology behind the war. In particular, the way the war was viewed at home. England had a mentality of "if you just leave it alone, the war will eventually take care of itself". However, Orwell believed that to survive a war you have to fight a war, and that evil will not just get rid of itself on its own – no country has ever collapsed without military intervention. The need for fighting does not imply that there is no room for compassion in war. For example, while Orwell was pinned down in a trench, by artillery, a German soldier came running in front of him trying to hold up his pants at the same time. Perhaps, that created a feeling of pity towards the soldier, and Orwell could not bring himself to shoot him. He began to think the war wasn't for the good of Spain, but for the good of the people in charge – the bourgeoisie. In the end, Orwell was like Graves and became very disenfranchised with the war, but it did not have the long lasting personal effects on him that the war did on Graves. One of the major reasons that made Orwell disenfranchised from the war is the way that the media covered the war. It had a very lopsided view of the outcome of battles. For example, battles declared as victories would sometimes actually be defeats. The media never dealt with the loss of men and materials, and the newspaper gave all its readers a very sheltered opinion of the war, which was that they were always in the right. The readers of the newspaper never had to deal with the loss of life, the sickness, or the poor conditions of an ordinary military soldier in the Spanish Civil War – they never say

or heard of that. And this made Orwell very upset because he knew the truth of what really went on in the war.

The final question we will be discussing in this essay is why did George Orwell and Robert Graves write the material that we read in class. I believe that the reason for George Orwell writing his essays, and Robert Graves writing Goodbye to all That, was because of the following two reasons: 1. So that wrongs could be righted when it came to the view of the wars that they were in. And by this I mean they wanted to give their readers a more humanistic and truthful view of what happened in the Spanish Civil War and World War II. They wanted to right the wrongs of the newspapers and the propaganda machines for their time. 2. I believe that this was therapeutic for Orwell and Graves to write about what actually happened in their lives while at school and away at the wars. I feel this part is epically true for Graves because of the much longer lasting impact of the wars on him.

In conclusion, through the topics addressed in this essay, you can see that there are quite a few similarities between Orwell and Graves, but yet some major differences between these two individuals. In addition, the reader might also be able to see why their writing had a major impact on English society for their own times and the for the present times.

Sample 4: The Boer War Letter

The Boer War started in 1899 which, happened to be the year of Queen Victoria's Diamond Jubilee. This was also the period in which the British Empire was at its zenith of power. But soon England's fun of would be over and they would find themselves embroiled in a war in South Africa against the Boers. This was as brought to be by the High Commissioner, Alfred Milner's, and his desire to gain economic power of the Empire. This gain way going to be met by securing the Dutch Boer gold mines and to dominate and rule the African continent.

This war cost the British Empire much, including 22,000 dead, and an unmet promise of a quick resolution. The war was to be over before Christmas, however it ended up lasting two and a half years. The British lasted the two and half years only to win the last battle of the war. Through these two and half years the British Empire struggled in the heat and dust of the South African desert.

The English were caught off guard in October of 1899 by the Boer's quick-witted offense, which helped the Boers capture the three towns of Ladysmith, Mafeking and Kimberly. These towns were located in Natal and Cape providence. The actions of the Boer military in these captures caught the British off guard and made them reevaluate their military strategy. Eventually they were able to lift the sieges of these three towns, ad also take over Boer's two capital cities in May and June of 1900.

After the sieges and the subsequent capture of the Boer capitals the British believe the war to be over. They were proven wrong as the some 'bitter-enders' survived and ran off into the bush of the Boer country. These survivors waged guerilla warfare against the British by using such tactics as; ambushing troops and garrisons, and blowing up supply trains. The British realize the tactics they are using are ineffective and switch over too guerilla warfare to match the Boer's tactics. The Britit's use such guerilla methods as burning crops and confining Boer women and children in concentration campus. Due to these methods the last of the Boer commandos have no food, clothing, or ammunition. After losing all of these essentials the last of the Boers end up surrendering in may of 1902m with the Treaty of Vereeniging. The surrendering and Treating officially end the war with the Boer.

A soldier in the English Army wrote this letter during the Boer War. The letter was written on June 13th of 1902. This date is significant because it tells us that the letter was written at the end of the war. It was mailed from No. 22 General Hospital. It was written by Cecil G. C. Lillingston, to a friend named George whose "last name is not given."

The first page of Lillingston's letter deals with the fact that he received 14 letters last week and can only write George briefly to enable him to respond to the rest of the letters. Lillingston informs George he will be sending him six photographs, which he asks George to send or take to his sister, which we believe to be named [Ellie?]. Ellie works at the London Hospital, and Lillingston asks George to take the letter to Ellie at work in person if he has the time. After showing the [photographs]

He sends the letter and photographs to George first because he will find them of interest. Then he tells George that he can keep them for a few days and show them to a few of Lillingston's friends. He hopes to send George another photograph soon. It is of Lord Kitchener who was in charge of the military in Africa during the Boer War. Lord Kitchener came up and inspected the No. 22 General hospital and consented to have a photograph taken with a few of the hospital officers. I searched the London Times for such a photo but I was not able to find the photograph Lillingston is speaking of and I believe it went to a private collection.

Next thing the letter states is that the peace has been accepted very quietly around South Africa. Lillingston was alluding to the fact they will eventually be a treaty ending the war and that will be signed in October of 1902. The next thing Lillingston describes in his letter is that there has been Thanksgiving service and no outward demonstrations against the peace and future treaty. The next thing discussed in Lillingston's letter is that he was fortunate to be included in a procession with a detail of 65 regiments, 12 brass bands. This happened at the Sunday services. I was able to find that the British Army has a history of putting on religious parades during times of war for the moral of the troops and to celebrate the peace. The next thing Lillingston discussing in the letter is that he will not be home for another nine months yet. On the last page of the letter Lillingston begins by saying the nights in South Africa are colder than anything they have experienced in England. He continues by saying the George's letter has just arrived telling him that George had been seedy, about what we do not know and have no additional information to tell us. He goes on talking to George that he must be quite fit now and we take this to be physically and will be in the thick on conversion festivals. We take Conversion Festivals to be a religious ceremony but we are not sure. Lillingston finished his letter to George by saying Kindest regards to, [Ellee} and yours ever so sincerely.

Cecil G. C. Lillingston

DEAD ENDS

George – due to lack of last name there was no way to look up information on this individual. I even went so far as to ask the reference librarian at the Rod library and they came to the same conclusion.

Ellie Lillingston Samuel Palmer, Richard House, Shepperton-on-thames, (1902) London Times Newspaper, January 1 to March 31

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the Boer War South Africa, 1899-1902,
([http://www/gepitties.cpm/Athens/Acropolis/8141/boerwar.html](http://www.gepitties.cpm/Athens/Acropolis/8141/boerwar.html))

H.J. Hanham (1979). In Ed. R. R. Langham-Carter An Anglo-Boer War Memorial in Wynberg, Religion and nationality in the Mid-Victorian Army. (See attached page at the end of the report it shows that the British Army has a history of having a ceremony like the one discussed in the letter.

Samuel palmer, Richard House, Shepperton-on-thames, (1902) London Times Newspaper, January 1 to March 31

APPENDIX K
HARVEY'S SCHERER'S
MPT MODEL

		Milieu	Person	Technology
U S E	Optimal	Support from family/peers employer Realistic expectations of family/employer <i>Setting/environment fully supports and rewards use</i>	Proud to use device Motivated <i>Cooperative</i> Optimistic Good coping skills <i>Patient</i> Self-disciplined <i>Generally positive life experiences</i> <i>Has the skill to use the device</i> Perceives discrepancy between desired & current situation	<i>Goal achieved with no pain, fatigue or stress</i> Compatible with /enhances the use of other technologies <i>Is safe, reliable, easy to use and maintain</i> Has the desired transportability No better options currently available
	Partial/ Reluctant	<i>Pressure for use from either family/peers/employer</i> Assistance often not available Setting/environment discourages use or makes use awkward	<i>Embarrassed to use device</i> <i>Unmotivated</i> Impatient/impulsive Unrealistic expectations Low self-esteem Somewhat intimidated by technology Technology partially or occasionally fits with lifestyle Deficits in skills needed for use	Goal not fully achieved or with discomfort/strain <i>Requires a lot of set-up</i> Interferes somewhat with the use of other technologies Device is inefficient <i>Other options to device use exist</i>
N O N U S E	Avoidance	Lack of support form either family/peers/employer Unrealistic expectations of others Assistance not available Setting/environment disallows or prevents use	Person doesn't want it <i>Embarrassed to use device</i> Depressed <i>Unmotivated</i> Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use <i>Requires a lot of set-up</i> Perceived or determined to be incompatible with the use of other technologies Too expensive Long delay for delivery <i>Other options to device use exist</i>
	Abandonment	Lack of support from either family/peers/employer Setting/environment discourages or makes use awkward Requires assistance that is not available	<i>Embarrassed to use device</i> Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies Has been outgrown Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX L
MAE'S SCHERER'S
MPT MODEL

		Milieu	Person	Technology
U S E	Optimal	Support from family/peers employer Realistic expectations of family/employer Setting/environment fully supports and rewards use	Proud to use device Motivated Cooperative Optimistic Good coping skills <i>Patient</i> Self-disciplined Generally positive life experiences Has the skill to use the device Perceives discrepancy between desired & current situation	Goal achieved with no pain, fatigue or stress Compatible with /enhances the use of other technologies Is safe, reliable, easy to use and maintain Has the desired transportability No better options currently available
	Partial/ Reluctant	Pressure for use from either family/peers/employer Assistance often not available <i>Setting/environment discourages use or makes use awkward</i>	<i>Embarrassed to use device</i> <i>Unmotivated</i> <i>Impatient/impulsive</i> Unrealistic expectations Low self-esteem Somewhat intimidated by technology <i>Technology partially or occasionally fits with lifestyle</i> Deficits in skills needed for use	Goal not fully achieved or with discomfort/strain <i>Requires a lot of set-up</i> Interferes somewhat with the use of other technologies Device is inefficient <i>Other options to device use exist</i>
N O N U S E	Avoidance	<i>Lack of support from either family/peers/employer</i> Unrealistic expectations of others Assistance not available <i>Setting/environment disallows or prevents use</i>	Person doesn't want it <i>Embarrassed to use device</i> Depressed <i>Unmotivated</i> Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use <i>Requires a lot of set-up</i> Perceived or determined to be incompatible with the use of other technologies Too expensive <i>Long delay for delivery</i> <i>Other options to device use exist</i>
	Abandonment	<i>Lack of support from either family/peers/employer</i> <i>Setting/environment discourages or makes use awkward</i> Requires assistance that is not available	Embarrassed to use device Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies <i>Has been outgrown</i> Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX M
MARK'S SCHERER'S
MPT MODEL

		Milieu	Person	Technology
U S E	Optimal	Support from family/peers employer Realistic expectations of family/employer <i>Setting/environment fully supports and rewards use</i>	Proud to use device Motivated <i>Cooperative</i> <i>Optimistic</i> Good coping skills <i>Patient</i> <i>Self-disciplined</i> Generally positive life experiences <i>Has the skill to use the device</i> Perceives discrepancy between desired & current situation	<i>Goal achieved with no pain, fatigue or stress</i> Compatible with /enhances the use of other technologies <i>Is safe, reliable, easy to use and maintain</i> Has the desired transportability No better options currently available
	Partial/ Reluctant	Pressure for use from either family/peers/employer Assistance often not available Setting/environment discourages use or makes use awkward	Embarrassed to use device Unmotivated Impatient/impulsive Unrealistic expectations Low self-esteem Somewhat intimidated by technology Technology partially or occasionally fits with lifestyle Deficits in skills needed for use	Goal not fully achieved or with discomfort/strain Requires a lot of set-up Interferes somewhat with the use of other technologies Device is inefficient Other options to device use exist
N O N U S E	Avoidance	Lack of support form either family/peers/employer Unrealistic expectations of others Assistance not available Setting/environment disallows or prevents use	Person doesn't want it Embarrassed to use device Depressed Unmotivated Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use Requires a lot of set-up Perceived or determined to be incompatible with the use of other technologies Too expensive Long delay for delivery Other options to device use exist
	Abandonment	Lack of support from either family/peers/employer Setting/environment discourages or makes use awkward Requires assistance that is not available	Embarrassed to use device Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies Has been outgrown Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX N
RENEE'S SCHERER'S
MPT MODEL

		Milieu	Person	Technology
U S E	Optimal	<i>Support from family/peers employer</i> Realistic expectations of family/employer Setting/environment fully supports and rewards use	Proud to use device Motivated <i>Cooperative</i> Optimistic Good coping skills <i>Patient</i> <i>Self-disciplined</i> <i>Generally positive life experiences</i> <i>Has the skill to use the device</i> Perceives discrepancy between desired & current situation	Goal achieved with no pain, fatigue or stress Compatible with /enhances the use of other technologies <i>Is safe, reliable, easy to use and maintain</i> Has the desired transportability No better options currently available
	Partial/ Reluctant	Pressure for use from either family/peers/employer Assistance often not available <i>Setting/environment discourages use or makes use awkward</i>	<i>Embarrassed to use device</i> Unmotivated Impatient/impulsive Unrealistic expectations Low self-esteem Somewhat intimidated by technology Technology partially or occasionally fits with lifestyle Deficits in skills needed for use	<i>Goal not fully achieved or with discomfort/strain</i> Requires a lot of set-up Interferes somewhat with the use of other technologies Device is inefficient <i>Other options to device use exist</i>
N O N U S E	Avoidance	Lack of support from either family/peers/employer Unrealistic expectations of others Assistance not available Setting/environment disallows or prevents use	Person doesn't want it <i>Embarrassed to use device</i> Depressed Unmotivated Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use Requires a lot of set-up Perceived or determined to be incompatible with the use of other technologies Too expensive Long delay for delivery <i>Other options to device use exist</i>
	Abandonment	Lack of support from either family/peers/employer Setting/environment discourages or makes use awkward Requires assistance that is not available	<i>Embarrassed to use device</i> Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies Has been outgrown Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX O
TRAVIS'S SCHERER'S
MPT MODEL

		Milieu	Person	Technology
U S E	Optimal	Support from family/peers employer Realistic expectations of family/employer <i>Setting/environment fully supports and rewards use</i>	<i>Proud to use device</i> Motivated Cooperative Optimistic Good coping skills Patient Self-disciplined <i>Generally positive life experiences</i> Has the skill to use the device Perceives discrepancy between desired & current situation	Goal achieved with no pain, fatigue or stress Compatible with /enhances the use of other technologies is safe, reliable, easy to use and maintain Has the desired transportability No better options currently available
	Partial/ Reluctant	Pressure for use from either family/peers/employer Assistance often not available Setting/environment discourages use or makes use awkward	Embarrassed to use device Unmotivated Impatient/impulsive Unrealistic expectations Low self-esteem Somewhat intimidated by technology Technology partially or occasionally fits with lifestyle Deficits in skills needed for use	<i>Goal not fully achieved or with discomfort/strain</i> <i>Requires a lot of set-up</i> Interferes somewhat with the use of other technologies Device is inefficient <i>Other options to device use exist</i>
N O N U S E	Avoidance	Lack of support from either family/peers/employer Unrealistic expectations of others Assistance not available Setting/environment disallows or prevents use	Person doesn't want it Embarrassed to use device Depressed Unmotivated Uncooperative Withdrawn Intimidated by technology Many changes required in lifestyle Does not have skills for use	Perceived lack of goal achievement or too much strain/discomfort in use Requires a lot of set-up Perceived or determined to be incompatible with the use of other technologies Too expensive Long delay for delivery Other options to device use exist
	Abandonment	Lack of support from either family/peers/employer Setting/environment discourages or makes use awkward Requires assistance that is not available	Embarrassed to use device Depressed Low self-esteem Hostile/angry Withdrawn Resistant Poor socialization & coping skills Many changes in lifestyle with device use Lacks skills to use device & training is not available	Goal not achieved and/or discomfort/strain in use Is incompatible with the use of other technologies Has been outgrown Is difficult to use Device is inefficient Repairs/service not timely or affordable Other options to use became available

APPENDIX P
ASSESSMENT TOOL

ASSESSMENT TECHNOLOGY ASSESSMENT TOOL

All information is obtained from student and teacher reports, and direct observation.

General Information

Date: _____

Name: _____

Age: _____ Birthdate: _____ Phone: _____

Classification:

_____ High School Freshman Sophomore Junior Senior

_____ College Freshman Sophomore Junior Senior

College major: _____Future Goals

Identify the student's educational goals. (e.g., Pursing a higher educational degree, pursuing an advanced degree).

Identify student's future career goals.

User

Identify student's academic strengths and weaknesses.

	Strengths	Weaknesses
Language		
Math		
Reading		
Spelling		
Writing		
Listening		
Memorization Skills		
Organizations		
Study Skills		

Identify any of the student's physical challenges.

	Describe the limitation	Describe modification currently used
Fine motor – hands, arms, digits, etc		
Range of motion (limited, normal)		
Muscle control (limited, normal)		

Identify the student's process for completing written homework assignments. Describe the student's process for writing a research paper, an opinion essay.

Identify the student's weekly commitments and the number of hours those activities consume. (e.g., classes 15 hours, work 10 hours, studying 15 hours, volunteer 5 hours a week, etc)

Why does the student want to learn the speech recognition program? (Identify if learning the program is a need or a want and if the reason for learning program is student's own desire or someone else's recommendation.)

Identify how the student perceives utilizing the speech recognition program (for what purpose?). (Asking this question to identify specific speech recognition skills that may need to be taught. For example, surfing the Internet, accessing email)

Identification of the student support system. Identify those individuals who are available to assist with questions regarding the speech recognition program.

Environment

Identification of the environment.

A) Accommodations:

_____ House
 _____ Apartment
 _____ Residence Hall

Occupants:

_____ Self
 _____ Roommates Number _____
 _____ Family Number _____

B) Description of computer location.

- Location of computer (e.g., family room, living room, dining room, bedroom, kitchen, etc.) _____

- Room open or closed to other rooms? _____

- Traffic flow around computer high or low? (Identification of possible distractions)

- Noise level in the environment loud or soft? (Identification of possible interference)

- Identify the lighting sources in the environment. (Is the area well lit?)

Technology Experience

Describe the student's computer experience (platform used, activities completed).

Describe student's experience with assistive technology you are currently using or have used in the past.

Assistive Technology	Experience – why device was used
Alternative keyboards/ mice/switches	
Communication board	
Computer (identify platform)	
Screen enlargement	
Speech synthesizer	
Touch screen	
Word prediction software	
Other:	
Other:	
Other:	

How does the student rate his or her computer skill ability?

_____ Excellent _____ Average _____ Poor

What computer platform does the student prefer?

_____ Macintosh _____ IBM _____ No preference

Computer skills observed

Observe the student's computer skills for each of the following and identify their competency using the following scale:

1=independent

2=verbal prompt required

3=physical prompt required

4=no response - skill needs to be taught

Computer Log-on

_____ Turn computer on

_____ Locate folder or program

_____ Access program

Word Processing

_____ Open word program

_____ Type in a blank document

_____ Spell/grammar check

_____ Use toolbar (underline, etc; cut, copy, paste)

_____ Change font style and size

_____ Print document

_____ Save document

_____ Close program

File Management

_____ Can identify location of document saved

_____ Can retrieve saved document