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THE EFFECTS OF STORY WEBBING AND VISUAL THINKING SOFTWARE ON THE WRITTEN LANGUAGE PERFORMANCE OF STUDENTS WITH MILD DISABILITIES

A Dissertation

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By

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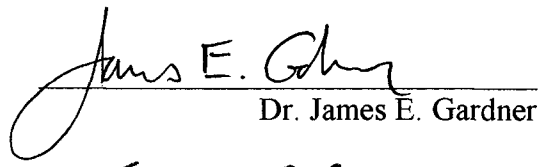
STUDENTS WITH MILD DISABILITIES

A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

BY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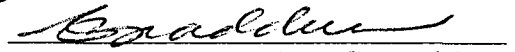
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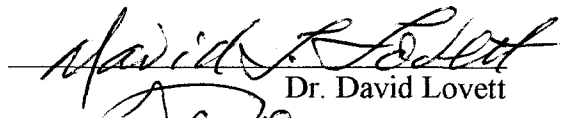
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ABSTRACT

The primary purpose of this mixed method quasi-experimental research was to examine the effects of teaching students with mild disabilities to use story webbing and visual thinking software. Changes in the quality and the quantity of students' writing, attitudes of students regarding the writing process, computer usage, and writing strategies, and as well as observed changes in student behavior and writing performance were explored.

A total of eighteen seventh and eighth graders, identified by their school district as having mild disabilities, participated in this four week study. Students were rank ordered and alternately assigned to the intervention or comparison group. The research design for this study included the evaluation of five writing samples for each student: two handwritten samples and three word-processed samples. The independent variables were story webbing which was generated by hand or Inspiration and no story webbing. The dependent variables were the spontaneous subtests, composite scores, and quotient scores from the *Test of Written Language 3rd edition (TOWL-3)*: T-unit counts; word counts; character counts; Student Attitudes Survey, Student Interview Questionnaire and daily Instructors' Observation Logs. MANOVA were conducted to analyze the statistical data.

The results of the study indicate that there were consistent increases in the quality of writing of students in the intervention group whether products were handwritten or word processed. Increases were also found in the writing quality of students in the comparison group; however, while statistically significant differences were found when products were word processed, only minimal gains where present when products were handwritten. In addition the quantity of written language performance was shown to

increase significantly between pretest and posttest for word processed products, yet little to no increase in the quantity handwritten was evident with either group when their writing samples were compared. Student attitudes regarding the writing process, computer usage and writing strategies were shown to improve when they were taught story webbing and visual thinking software. Positive changes in behavior and writing performance were observed by instructors within the study.

It is the conclusion of this study, that, because writing performance improved for both groups of students, having students write every day, giving them positive experiences with the writing process, and daily technology usage is probably the most practical solution for teachers from a pragmatic context. In this sense, the focus moves away from considering story webbing via technology in and of itself, to considering it one of many strategies which students perceive as a positive and useful support in the writing process.

CHAPTER ONE: INTRODUCTION

Overview

Learning to express oneself in written form is one of the most complex language tasks that a person undertakes (Gagné, Yekovich, & Yekovich, 1993; Zhang, 2000). The need for adequate writing skills is not exclusively for the purpose of academic performance as competent writing skills are crucial throughout one's life. Without adequate writing skills individuals struggle and may be prohibited from reaching their potential; academically, personally, and/or professionally.

The development of adequate writing skills is a fundamental requirement for academic success, in fact, written products are routinely used to evaluate student learning and performance. The school careers of students with insufficient writing skills are plagued by poor academic performance and low self-esteem (Anderson-Inman, 1999; Bridges, 1996; Okolo, 2000; Strum & Rankin, 1997; Zhang, 2000). Students with mild disabilities may find the demands of their academic curriculum more than they can endure (Anderson-Inman, 1999). They are faced with an inability to read, or write with sufficient fluency. These students are frequently frustrated by the academic tasks encountered at school (Deshler & Schumaker, 1993). In addition, motivational issues are important variables affecting the extent to which students are willing to engage in performing academic tasks (Anderson-Inman, 1999; Bridges, 1996; MacArthur, Graham, Schwartz, & Schafer, 1995; Morocco & Neuman, 1986; Outhred, 1989; Wong, 2000). Consequently, the development of writing proficiency for all students should be considered a primary concern for schools.

Writing can be challenging for any student; however, producing adequate written

products can be especially difficult for students with mild disabilities (Bryant & Seavy, 1998; Graham, Harris, & Larsen, 2001; Wong, 2000; Zhang, 2000). According to Okolo, Cavalier, Ferretti, and MacArthur (2000) deficits in written expression are a primary factor in the referral of students to special education. Students with mild disabilities also encounter difficulties in the areas of spelling and handwriting as well as in the actual writing process (Englert, Raphael, Fear, & Anderson, 1988; Okolo et al., 2000; Swiderek, 1998). Consequently, students with inadequate writing performance are frequently inefficient learners who typically appear unaware of strategies that could prove helpful to them in the classroom (Graham, Harris, MacArthur, & Schwartz, 1991; MacArthur et al., 1995; Morocco, & Neuman, 1986; Wong, 2000).

When writing skills are taught in school, it is common to have students practice those skills over and over again, and while practice is important, the continued difficulty exhibited by students with mild disabilities indicates that practice alone is not sufficient. Students with mild disabilities must be taught a variety of strategies, because no one strategy, such as ongoing practice, works for all (Deshler & Schumaker, 1993; Schumaker & Deshler 1992; Wong, 2000). Specifically, the teaching of effective writing strategies blended with instruction and practice should be considered the optimal goal. With this combined approach, students with learning disabilities are more likely to experience success (Deshler & Schumaker, 1993; First, MacMillan, & Levy, 1995; MacArthur et al., 1995; MacArthur, Schwartz, & Graham, 1991).

Good writers typically utilize several strategies when they are writing (Sexton, Harris, & Graham, 1998). They have numerous strategies in their repertoire, and know how and when to use them. Students with mild disabilities are frequently limited in their

knowledge and use of strategies (De La Paz & Graham, 1997; Deshler & Schumaker, 1993; Sexton et al., 1998; Wong, 2000). Even when students have been taught writing strategies, as a rule, they do not know how or when to use them. Students must be taught a variety of strategies and given abundant opportunities to practice using them. To increase the likelihood that strategies will be effectively utilized, they need to be easy to conceptualize, memorize, and convenient to use.

Technology Assistance for Students with Mild Disabilities

Research shows that some of the academic difficulties encountered by students with mild disabilities can be overcome, at least partially, by combining effective instructional strategies with compensatory strategies which employs technology (Bowser & Reed, 2000; Bridges, 1996; Bryant & Bryant, 1998; Bryant, Bryant, & Raskin, 1998; Deshler & Schumaker, 1993; Lewis, 1998a; McGregor & Pachuski, 1996; Okolo et al., 2000). Recent literature describes how technology can be utilized in numerous ways to enhance instruction and promote learning for students who have mild disabilities (Bangert-Drowns, 1998; Bridges, 1996; Gardner & Edyburn, 2000; Lewis, 1998a; Bryant et al., 1998). The advancements in technology and computer-supported writing tools in the last decade have been astounding. Word processing features now considered to be standard, have proven beneficial for experienced writers and certainly appear to hold the promise to assist struggling writers. Tools such as grammar checkers, spelling checkers, organizational tools, word prediction, and speech recognition programs are also available to assist students with mild disabilities. The concept of technology tools serving as writing supports is especially intriguing, considering that the 1997 revisions to the Individuals with Disabilities Education Act (IDEA) mandate that the need for assistive

technology be considered for every student with an Individual Education Plan (Bowser & Reed, 2000; Edyburn, 2000).

The decision to use computers in schools has not been limited to academic achievement outcomes. Teachers consistently report that the use of technology has a positive influence upon student motivation and attitude (Bangert-Drowns, 1998; Cochran-Smith, 1991; Lewis, 1998a; Lewis 2000). Many teachers relate stories about their students' improvements (Lewis, 1998a); however, it is difficult to find objective evidence of attitude changes (Lewis, 2000). A possible explanation for the lack of empirical evidence showing positive attitudinal effect is that change in attitude toward particular academic skills may be interpreted as attitude toward school in general. Therefore, it is difficult to document the source of the attitudinal change. Documentation of attitudinal change is important to assist in determining what actually motivates students and to help determine best practices for educators.

Writing Strategies and Visual Thinking Software

Many students with mild disabilities have wonderful ideas and stories that can be shared, however organizing those ideas and thoughts and writing them down are two very different tasks. Technology is one area which offers a myriad of tools to scaffold or assist students who have difficulty with the writing or organization components of writing (Okolo, 2000). The prewriting phase of writing has been shown to be the area of greatest difficulty to many students with mild disabilities (De La Paz & Graham, 1997; Hunt-Berg, Rankin, Beukelman, 1994). Fortunately, there are instructional strategies designed specifically to facilitate the organizational component of writing at the pre-writing phase. Story webbing, also referred to as concept mapping or story mapping, is one writing

strategy that can be used in the struggle to improve the written performance of students with mild disabilities. Positive effects have been demonstrated when using story webbing to help students organize their thoughts and ideas in preparing for writing (Avery, Baker, & Gross, 1996; Guastello, 2000; James, Abbott, & Greenwood, 2001; Schewel, 1989). Additionally, this strategy has the bonus of requiring no specific materials and can be utilized anywhere, therefore increasing the chance for generalization.

Planning and organizing tools which can encourage writing strategies, such as concept mapping, story webbing, brainstorming, visual graphing, and/or outlining are robust tools which can help students organize, synthesize, and comprehend content area information. These tools help students organize their ideas and investigate relationships during the writing process (Avery et al., 1996; Harris & Sipay, 1990; Polloway & Patten, 1993). One such software program, Inspiration, has been used to help students with mild disabilities improve student study skills, acquire content area information, and organize ideas (Anderson-Inman, 1999; Anderson-Inman & Zeitz, 1993; Scappaticci, 2000). Inspiration has the capacity to help students brainstorm their ideas, design a story web, and organize their ideas during the planning phase (Plotnick, 1997; Scappaticci, 2000).

Students with mild disabilities appear to be more likely to show improvement when they are taught specific strategies blended with instruction and practice (Deshler & Schumaker, 1993; First, MacMillan, & Levy, 1995; MacArthur et al., 1995; MacArthur, Schwartz, & Graham, 1991; Schumaker & Deshler 1992; Wong, 2000). However, there is limited research available that explores the idea of teaching writing strategies to students with mild disabilities and then having them use a visual organizational software program such as Inspiration to further their chance of producing an organized written

language product. Story webbing itself has shown to result in positive changes in writing performance, however when a strategy is enhanced by technology, specifically the software Inspiration and personal computers, are there even more positive effects?

Statement of Purpose

The purpose of this study was to investigate the written language performance of students with mild disabilities when they were taught story webbing, with and without visual thinking software, compared to students with mild disabilities who were simply given the opportunity to practice their writing skills using a word processor on a daily basis. Specifically, this study examined whether there would be a difference in the quality and/or the quantity of the written performance of the participants in an effort to determine what effects strategy instruction could have upon student performance. Technology was integrated into the academic unit to determine if the availability of this tool would be beneficial to students with mild disabilities. Students in the intervention group were taught to make story webs to organize their writing at the prewriting phase and to use the software program Inspiration to generate their story webs. The writing strategy of story webbing was chosen because it is a visual organizational tool and has shown to have a positive influence on the planning performance of students with mild disabilities (Avery et al., 1996; Guastello, 2000; James et. al., 2001; Schewel, 1989). The software Inspiration was used in an effort to facilitate the story webbing and to motivate students to engage in the planning activity.

It was hypothesized that the intervention group, who were taught the writing strategy, would demonstrate greater improvement in the quality and quantity of their writing compared to the comparison group which was simply given the opportunity to

practice writing skills daily. Additionally, student self-perception was expected to become more positive.

Significance of the Study

Educators acknowledge the need to pursue better written performance by students with mild disabilities and are constantly searching for the key to this improvement. Deficient functioning in the area of writing is a common reason for referral of students to special education (Okolo et al., 2000). Many of these students are thoughtful young people who have important thoughts and ideas, yet they experience tremendous difficulty transferring these thoughts to the written page. This communication difficulty often results in poor academic performance and low self-esteem (Bridges, 1996; MacArthur et al., 1995; Morocco & Neuman, 1986; Outhred, 1989). Due to the negative impact associated with poor writing, more research is needed to discover effective ways to help students with mild disabilities improve their written expression performance.

Effective strategies and technology usage may be the key to enabling many students with disabilities to become competent, even good, writers. Special education law now requires that assistive technology be considered for all students receiving special education services, therefore, it is critical to glean information regarding changes in performance when technology is used (Bowser & Reed, 2000). If students with mild disabilities can experience success organizing their thoughts, and producing written products of better quality and quantity when taught strategies and provided with technology tools, then there is great potential for practical application.

Research Questions

The purpose of this study was to measure the effects of story webbing and visual thinking software on the written language performance of students with mild disabilities. The research addressed the following questions:

1. When students with mild disabilities are taught story webbing and to use visual thinking software, is there an increase in the quality and quantity of their written language performance?
2. When students with mild disabilities practice their writing skills daily, without being taught story webbing or to use visual thinking software, is there an increase in the quality and quantity of their written language performance?
3. Is there a difference in the quality and quantity of the written language performance for students with mild disabilities when they are taught story webbing and to use visual thinking software, compared to students with mild disabilities who are not taught story webbing or to use visual thinking software?
4. Do students' self-perceptions regarding written language tasks, change when they are taught to use story webbing and visual thinking software?
5. When students are taught story webbing and to use visual thinking software, are changes in their behavior or writing performance observed by instructors?

Summary

Written language performance is one area where students with mild disabilities experience repeated and incapacitating difficulty, sometimes resulting in a lifetime of inadequate skills and unfilled potential. If these students are to overcome or compensate for these difficulties, specific strategies must be provided for them, and they must be

afforded time to practice these strategies. Additionally, students must be provided with needed tools, such as computers and software, to help compensate for their difficulties. A combination of writing strategies and technology tools should be explored in the quest to provide students with mild disabilities the assistance they need to improve their written language performance.

CHAPTER 2: REVIEW OF THE LITERATURE

Overview

The purpose of this review of literature is to discuss written language performance for students with mild disabilities and methods that can be used to improve performance; specifically, strategy instruction and technology usage. The areas to be reviewed are (a) the writing process for people with mild disabilities, (b) strategy instruction in the writing process, (c) the use of technology to improve the writing process, and (d) student attitudes regarding the writing process.

Writing Process Deficiencies of People with Mild Disabilities

Before one can decide how to improve the written performance of students with mild disabilities, the process of writing needs to be understood. Gagné et al. (1993) explained that writing is the process of communicating or expressing meaning through print or text. The process of learning to write represents the most complex language task (Zhang, 2000). According to Sexton et al. (1998) efficient writers utilize the stages of planning, translating, and reviewing. In the first stage, the writer sets goals, generates ideas, and organizes his/her thoughts. In the next stage, their ideas are transformed into words on paper. Finally, during the third stage, they review and evaluate what they have written and make necessary changes. Skilled writers develop a goal or plan to guide the process; however, students with disabilities, typically do not plan their writing, nor do they revise efficiently (Sexton et al., 1998).

Everyone faces challenges daily at school, home, and in the workplace. For people with mild disabilities these challenges can be especially problematic. These challenges arise primarily due to difficulties in acquiring skills such as reading, writing,

listening, speaking, and planning, that are needed to be successful (Bryant & Seay, 1998; Graham et al., 2001; Zhang, 2000). Students who have mild disabilities in the area of written expression seldom produce written work that is even close to the quality of their normally achieving peers (Graham et al., 1991; Zhang, 2000). These individuals can experience difficulty in any area of written expression. Although they frequently have great ideas, they often have difficulty getting their thoughts and ideas into written form. Literacy-related deficits are a primary factor in the referral of students to special education (Okolo et al., 2000).

Students with mild disabilities have difficulty determining the proper content for their written work (MacArthur et al., 1995). Even when they are able to generate their ideas, they seem to lack the strategies for organizing those ideas into a cohesive product (Graham et al., 1991). They appear to lack the declarative knowledge of their subject and the procedural knowledge of how to write the product (Gagné et al., 1993). Additionally, they lack the strategies to revise and edit their products (Englert et al., 1988; Graham et al., 1991) through self evaluation (MacArthur et al., 1995; Morocco, & Neuman, 1986).

The basic lack of knowledge concerning strategies and the failure to implement strategies by students with mild disabilities is an area explored by many researchers (Deshler, Schumaker, & Lenz; 1984; Graham et al., 1991; Newcomer & Barenbaum, 1991; Torgesen et al., 1994; Wong, 2000). Harris and Graham (1992) emphasize that students should be exposed to strategy instruction aimed at teaching students specific ways to structure their thoughts. Scruggs and Mastropieri (1993) suggest that educators should collaborate to determine effective strategies to teach a variety of academic and study skills to students across all subject areas. When a direct, systematic approach is

used to teach academic problem solving, the students have shown improvement in performance (Carnine, Silbert, & Kameenui, 1997; Deshler & Schumaker, 1993).

Writing Strategy Interventions for Students with Mild Disabilities

Students with mild disabilities have substantial difficulties with basic writing skills, such as spelling, sentence formation, capitalization, and handwriting (Bridges, 1996; Cochran-Smith, 1991; Englert et al., 1988; Graham et al., 1991; Wong, 2000). They often possess a limited number of *efficient* strategies that they can use to plan their writings and organize their thoughts (Bridges, 1996; De La Paz & Graham, 1997; Englert et al., 1988; Graham et al., 1991; Nicholas, 2002; Outhred, 1989; Thomas, Englert, & Gregg, 1987). Simply put, students lack knowledge about the criteria necessary for good writing and do not appear to understand how to communicate effectively in written form (Bridges, 1996; De La Paz & Graham, 1997; Englert, Raphael, Anderson, Anthony, & Stevens, 1991: Englert & Thomas, 1987; Graham et al., 1991; Wong, 2000). They tend to view good writing as simply a matter of form rather than substance (Graham et al., 1991). Therefore, students with disabilities often approach writing by retrieving from memory whatever seems appropriate and writing it down (Scardamalia & Paris, 1985; Wong, 2000), thereby minimizing, or even excluding, the role of reflection and planning in the composition process (De La Paz, & Graham, 1997; MacArthur & Graham, 1987). It is no wonder that the writing of many students with mild disabilities, reflect disorganized, inferior products, and students rarely can articulate plans for improvement.

Strategies for Written Processing Deficiencies

When students are identified as having written expression difficulties, the standard approach is to have them concentrate on practicing grammar skills in isolation,

assuming that these skills will generalize into good writing skills. This is rarely the case instead the difficulties which were present simply continue (First et al., 1995). When writing is taught as a process, it enhances the student's cognitive abilities and increases their understanding of writing (First et al., 1995; MacArthur et al., 1995; MacArthur et al., 1991).

Strategy instruction has become the focus of several research studies evaluating the writing performance of students with mild disabilities (Bryant & Bryant, 1998; Graham et al., 2001; Tone & Winchester, 1988; Wong, Butler, Ficzere, & Kuperis, 1996). Not surprisingly, when researchers investigated the higher order cognitive problems experienced by students with learning disabilities they found the students to be deficient in skills associated with the writing process of planning, writing, and revising (Englert et al., 1988; Newcomer & Barenbaum, 1991; Okolo et al., 2000; Swiderek, 1998). This became the focus of one study conducted by Wong et al., (1996). Their instructional strategy contained three components: planning, writing a first draft, and revising. While positive outcomes were shown for their instructional methods, the students with learning disabilities continued to have a great deal of mechanical errors (Graham, 1990; Poplin, Gray, Larsen, Banikowksi, & Mehring, 1980).

Many students who struggle with their writing find the prewriting phase to be the most difficult portion of the writing process (De La Paz, & Graham, 1997; Hunt-Berg et al., 1994; MacArthur & Graham, 1987). Prewriting is the phase that includes planning, idea generation, goal setting, and organization. Struggling writers often lack the strategies for generating and tailoring their ideas to fit the writing task, as well as organizing and categorizing their ideas into an appropriate format (Torgesen, 1988). Students with

learning differences tend to minimize the role of planning and give scant attention to evaluating their information (De La Paz, & Graham, 1997; Vallecorsa & Garriss, 1990). Hunt-Berg et al. (1994) report there are many organizational tools available to help students overcome the challenges of writing. Some tools help writers generate topics and content for their writing projects.

Organizational assistance should be a prime concern in teaching written language, because teachers report inadequate organizational difficulties as a deterrent to school success for many students (Edyburn, 2000). According to Supon (1998) educators can use visualization to teach important concepts so students can sharpen their ability to organize information. Supon (1998) suggested that teachers should emphasize visuals and visualization activities for their student's writing assignments by using brainstorming webs, graphic organizers, and thinking process maps. Bailey, O'Grady-Jones, and McGown (1995) point out children's books are full of pictures, yet when students are taught to write, visual images are often ignored. However, when graphic organizers were used by students with mild disabilities they tended to show gains in their written performance (Avery et al., 1996; James et al., 2001).

Story webbing

Story webbing is one graphic organization strategy for teaching students the writing process. Story webbing has often been referred to as clustering, semantic webbing, concept mapping, idea diagramming, and brainstorm mapping; and is essentially a visual, or graphic, representation of the organization of a story. It provides a "bird's eye view" of the basic structure of a story (Li, 2000).

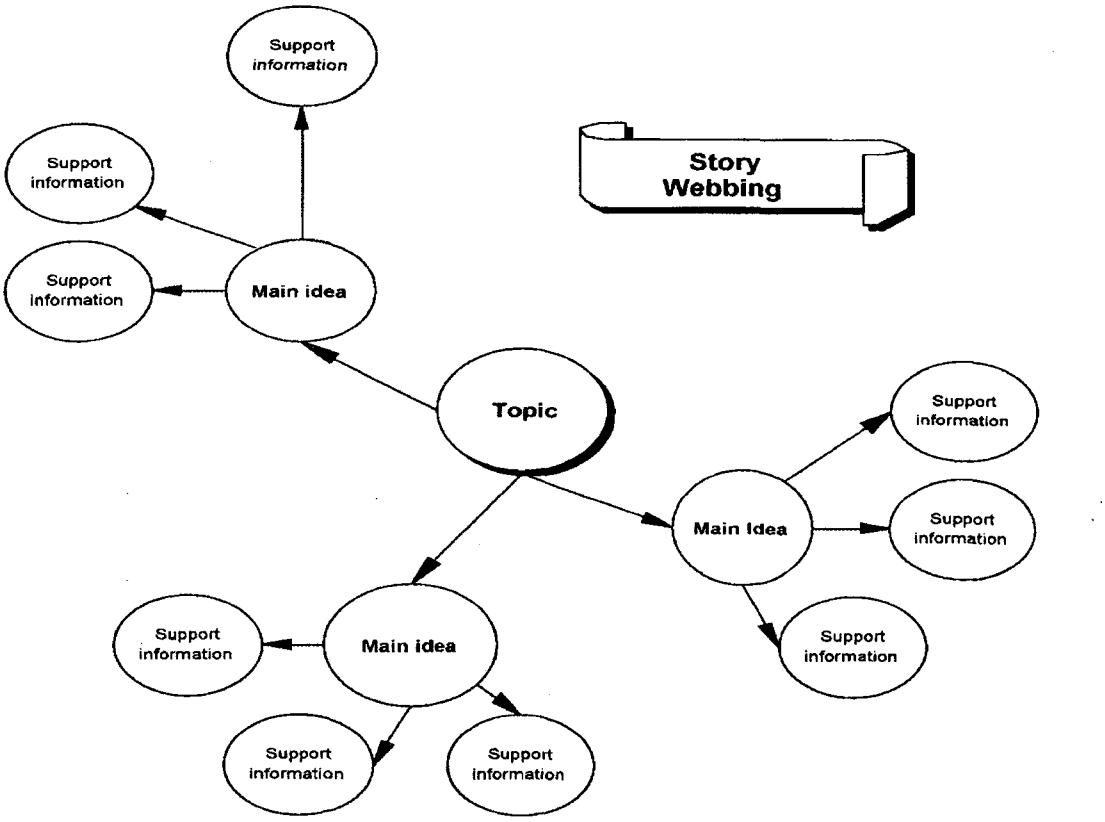
First, MacMillan, and Levy (1995) define story webbing as a prewriting tool, taken from the familiar concept of brainstorming. They stated that instead of brainstorming by words or phrases, students are shown how to cluster concepts or thoughts by centering a key word or phrase, circling it, and then connecting each related word or idea. Story webbing helps students assess their prior knowledge, organize their ideas and blend information into a written product (Avery et al., 1996; Harris & Sipay, 1990; Polloway & Patten, 1993). Webbing has been shown to help students visualize how new information fits into existing frames and encourages students to make predictions (Guastello, 2000; Hoover & Rabideau, 1995; Stahl-Gemake, 1982).

The premise behind using clustering or story webbing as part of the pre-writing process is that the writing moves from a part to a whole. By clustering the words together to look like a web (Figure 1), this type of writing technique provides a visual organization for students' ideas. Students are able to visualize the relationships between their words and ideas. A key component of story webbing is therefore the ability of the student to view a visual illustration of a main concept and its relations to the subordinate ideas (Hoover & Rabideau, 1995; Stahl-Gemake, 1982), which can be particularly advantageous for students with learning disabilities (Avery et al., 1996; Guastello, 2000; James et. al., 2001; Schewel, 1989).

The effects of graphic organizers were explored by Ruddell and Boyle in 1989 as a planning strategy with 51 college students. During this study, the strategy was used to assist students as they gathered and organized information from expository text. Students were enrolled three classes, two served as the intervention groups and one served as the control group. Students in the intervention groups were taught to use graphic organizers

to organize their information while it was being gathered, categorize the information and then to use their graphic organizer as an outline for writing. Students in the intervention group scored higher on holistic scales, showed greater attention to details, and wrote longer essays than their control group peers. Students were given only 10 minutes to complete their work, which represented a definite limitation to this study.

Figure 1. Story Webbing Diagram



The research which has examined the effects of using story webbing as a planning tool for the written expression products of students with mild disabilities is not extensive; however, it is promising. Zipprich (1995) conducted a study in which she taught 13 students with learning disabilities to use a pre-constructed story web in an effort to improve their story writing ability. During intervention, students were shown a picture,

given a pre-constructed web and the web was filled in together as a group. During the final phase, students were shown a picture and asked to fill in the pre-constructed web and compose a story individually. Students were given 30 minutes to complete the assignment. Student planning time and holistic scores showed improvement, although their numbers of words and number of T-units did not show consistent gains. Zipprich documented that before intervention, student planning time was an average of one minute in length. She also noted that the areas that failed to show improvements were not actually taught during her study and emphasized the need for instruction in sentence structure and the mechanics of writing for students with learning disabilities. Zipprich concluded that providing students with a pre-structured web encouraged them to utilize a strategy to facilitate organizing and planning their stories.

According to the Kaminski (1993), graphic organizers were used as a prewriting tool for students in two fourth-grade classes. Over the course of an entire school year, the experimental group practiced using graphic organizers as a prewriting tool on a daily basis, while the control group used graphic organizers as a prewriting tool occasionally. At the end of the school year, more students in the experimental group were shown to be highly organized and to be more knowledgeable about their own writing.

The effects of story-map instruction on the reading and writing skills of three seventh grade students diagnosed with learning disabilities were examined by Vallecorsa and deBettencourt (1997). This study was an ABC design with A being baseline, reading being B and writing being C. During the six reading sessions, students were taught to record the elements of the stories they read by using a story-map. During the six writing sessions students were taught to use the story-map as a story planning instrument.

Improvement in academic performance was evidenced during reading and writing activities by using the story-mapping strategy.

In the studies presented above, story webbing appears to be a viable strategy to teach students with disabilities. Yet there are areas which still need to be examined. First, many of the story webbing studies deal with expository reading or writing (Strum & Rankin-Erickson, 2002), other forms of writing stills need to be examined. Also, the study by Zipprich (1995) used a pre-structured web that would not support generalization into other environments. Therefore, while it appears that story webbing promises to be a helpful strategy for students with mild disabilities to use as a prewriting tool to plan what they will write, one has to wonder if this basic strategy can be enhanced and paired with other strategies and/or tools to empower students even more. Given that a number of technology-based tools are readily available and appear to hold promise for assisting students with poor writing skills, it seems reasonable to investigate the use of technology to improve the written language performance of students with mild disabilities.

Technology Used to Improve Writing

Computers and related technologies are widely regarded as having great potential for enhancing the performance of students with mild disabilities (Bryant & Bryant, 1998; Lewis, 1998a; Okolo et al., 2000). They allow the user to develop compensatory skills that help bypass the area(s) of deficiency (Bowser & Reed, 2000; Bridges, 1996; Bryant & Bryant, 1998; Bryant et al., 1998; Lewis, 1998a; McGregor & Pachuski, 1996; Okolo et al., 2000) and capitalize on strengths (Bryant & Bryant, 1998; McGregor & Pachuski, 1996). Technology has provided more opportunities for students with disabilities to use their powers of expression to a greater extent, specifically, research has been conducted

concerning the use of word processor programs to enhance the written performance of students.

Computers are the most popular type of assistive technology. Computers are powerful tools that provide a wide range of opportunities for significant impact. They can affect the writing process and facilitate some types of writing instruction (MacArthur, 1988; Graham et al., 1991). Computers can be helpful in planning, writing, and correcting the written product. They have been shown to be beneficial for students with mild disabilities, especially for those who find writing frustrating (Bowser & Reed, 2000; MacArthur, 1996). Students with mild disabilities display greater difficulty on numerous written language tasks (Bowser & Reed, 2000). In addition to the difficulty composing the written product, the actual physical act of handwriting may be difficult for many students with disabilities. Recent research indicates that writing performance can be improved with meaningful writing assignments that provide a supportive social context for writing, and instruction in the writing process (Lewis, 1998b).

The effectiveness of using technology to support writing has been demonstrated by numerous researchers (Bangert-Drowns, 1998; Bridges, 1996; Bryant et al., 1998; Graham & MacArthur, 1988; Lewis, 1998b; MacArthur et al., 1991; Outhred, 1989). Technology devices such as word processors, talking computers, speech recognition systems, spelling checkers, and other educational software, have been used to foster academic success and independence (Bryant & Seavy, 1998). These tools also facilitate the user in making compensations for reading, mathematics, writing, and spelling difficulties (Bowser & Reed, 2000).

Teachers in the area of special education have long held the belief that technology can help students with mild disabilities acquire skills. Okolo et al. (2000) report that in their survey of special education teachers, 97 percent indicated confidence that technology could help students with special needs compensate for areas of deficits. However, simply purchasing computers and placing them in the classroom does not guarantee that they will be used effectively or even at all (Okolo, Bahr, & Rieth, 1993). Teacher and student training are required to effectively use technology (Lewis, 1997). Careful attention must be given to the selection of hardware and software because the required features and level of support varies from student to student (Edyburn, 2000; Strum & Rankin, 1997).

Advancements in computer-supported writing applications in the last few years have been phenomenal. The features considered standard today are far superior to those available in the past (Lewis, 1998a). Tools such as grammar checkers, spelling checkers, dictionaries, and thesauruses now operate in conjunction with standard word processor programs and add additional support for writers. Many of the features discussed are now standard options in word processing software that are currently being purchased. For students who have visual, speech, or physical disabilities of one sort or another, software such as speech synthesis, word cueing, and word predictions are extremely beneficial (Cochran, 2000; Langone, 2000; Lewis, 2000; Okolo, 2000). These features are beneficial even with experienced writers and struggling writers find them particularly attractive. They have been found to increase motivation to write as well as to improve the quantity and quality of the writing (Cochran-Smith, 1991; Tone & Winchester, 1988).

Grammar Checkers

Grammar corrections and grammar checkers are common features of word processors. They identify grammatical errors and suggest alternative grammatical forms. The writer previews those suggestions and decides which ones to implement and which ones to ignore. This is especially helpful for people who have difficulty with syntax, grammatical rules, and practices (Hunt-Berg et al., 1994). Grammar checker can actually be helpful in learning grammatical rules and practices. It can serve as a tutor that not only prompts, but also explains when and why a suggestion works.

Computer-assisted writing is the area of interest for a study by Hunt-Berg et al., (1994). They assert that their concern is to help struggling writers utilize the different components that are available on computers. They maintain that any writer would find it more helpful to use computer-supported writing. This certainly applies to most people who have poor handwriting, write slowly or illegibly, or find spelling problematic.

Revision of Text

Word processors permit text revisions to be made quickly and neatly (Dalton, 1989; Espin, Shin, Deno, Skare, Robinson, & Benner, 2000; MacArthur, 1988). Spelling and grammar checker programs can help with the basic mechanics of these skills. Morocco & Neuman (1986) maintain that the features of the word processor most desirable for students are the ease of entering and editing text. The ability to make frequent revisions, without having to recopy is also of great benefit (Dalton, 1989; Graham et al., 2001; Graham et al., 1995; MacArthur, 1996). The ease of making revisions can be enhanced by teaching revision strategies so that the student understands

how to go about improving their writing by making these revisions (MacArthur, 1996; Graham et al., 1991; Graham et al., 1995).

Keyboarding Features

Keyboarding text into a word processor is one strategy that can help students to compensate for their writing difficulties due to poor handwriting skills (Cochran-Smith, 1991; Okolo, Bahr, & Reith, 1993) or a physical limitation that prevents the production of a written product (MacArthur, 1999; Graham et al., 2001). Although some improvement is evidenced when students use a word processor (Bangert-Drowns, 1998; MacArthur et al., 1995; Zhang, 2000), the level of keyboarding skills influence the extent that a student can benefit (Espin et al., 2000; Lewis, 1998a; Outhred, 1989). If a student is not familiar with keyboarding this support tool may actually become a burden because it slows text production and can impede the higher cognitive processes needed for written language production (Okolo et al., 2000).

Printed work can be produced in an efficient and attractive manner with the use of word processors (Dalton, 1989; Graham et al., 2001; MacArthur, 1988). Being able to produce neat work may be particularly important to a student who has never been able to produce a product of which they are proud (MacArthur, 1996). Actually, computer output can change the social context of writing by producing a product that is suitable for publishing for a variety of audiences (MacArthur, 1988).

Word Processing in the Context of Writing Models

Stoddard and MacArthur listed several limitations of their 1993 study which was designed to determine the effectiveness of improving writing revision skills. This model integrated strategy instruction, peer responses, and word processing. First, the influence

of peer interaction and strategy instruction was combined, with no consideration for the possibility of separation. Second, the study was limited to personal narratives. Third, the study did not determine which components of the strategy instruction were considered most effective.

Therefore, as an extension of the 1993 study, MacArthur et al. (1995) conducted an evaluation of a writing model that integrated a process approach, strategy instruction, and word processing. The teachers established a social context for writing and used only tasks that were meaningful with the students. Students wrote on topics that had meaning and value for themselves. They shared their writings with their peers, and they published their work for real audiences. The classrooms were structured to support a writing process model that reflected a cycle of planning, drafting, revising, and publishing products. This model was implemented for one school year. There were 113 students with learning disabilities in the experimental group and 94 students with learning disabilities in the control group. At the conclusion of the year, students from both the experimental and the control group improved the quality of their narrative and informative writing skills during the year. However, the gains that were made by the experimental group were almost twice as large as those made by the control group. There were no differences between the groups when it came to the mechanical errors of spelling, capitalization, and punctuation. However, there was a significant improvement in spelling when comparing the pretest and the posttest score for the experimental group. MacArthur et al. concluded that the lack of improvement on the mechanical skills might have been due to the emphasis on meaningful writing and in the planning and revising of the products. In terms of the writing process, they suggested that two issues may have

influenced the outcomes. One issue was limited access to equipment as the ratios of computers to students were 1:2 and 1:3. Another possible issue stemmed from poor attention to staff development during the planning and implementation of the study. The authors concluded that the combination of the strategy instruction and process approach used in conjunction with word processing would be more effective than either in isolation.

Graham and MacArthur (1988) used a six-step self-instructional strategy-training program. The purpose was to improve the revising behavior and quality of written products composed by students with learning disabilities when using word processors. Subjects of the study were three elementary school students, ages ten and eleven. These students were served part-time in a resource room, had IQ scores in the normal range, and were all at least two years below grade level in one or more academic areas. All three students had considerable experience with the word processor. All students were shown to have significant improvement in the revisions they completed, the length of their product, and the quality of their product. These improvements were shown to generalize to other methods of output and the effects were maintained over time. Students reported that they felt more confident with their writing and revising skills.

Outlining and Visual Graphic Software

Many students with mild disabilities have difficulty organizing their work with regard to the topic, category, and proper sequence (James et al., 2001). They have a limited repertoire of strategies from which they can employ in setting goals for their writings, organizing their thoughts, and making improvements by editing and revising their writings (Graham et. al. 1991; Outhred, 1989; Thomas et al., 1987). Outlining

programs, which are available on word processors, or as stand-alone programs, can help with these difficulties (Raskind & Higgins, 1998). These programs allow the student to "dump" information into the program and then organize it in an appropriate manner. Outlining programs can automatically insert Roman Numerals, letters, and Arabic numbers. The author then decides what information is to be viewed. This is particularly helpful for students who tend to focus on the details and cannot see the big picture, or vice versa.

Graphic or visual organizers can also be beneficial in the planning and structuring of student writing products (Avery et al., 1996; Dalton, 1989; First et al., 1995; James et al., 2001) allowing students to visualize how information fits together (Behrmann, 1994; Guastello, 2000; Hoover & Rabideau, 1995; Stahl-Gemake, 1982). Using a software program, such as Inspiration, students are encouraged to brainstorm ideas (Lewis, 1998a; Raskind & Higgins, 1998). The user can create a visual display of ideas, such as an idea map, a cluster, a story web, or a flow chart. Next, the student can move, rearrange, and/or categorize the ideas. The graphic can then be transferred into outline form if desired.

Inspiration software is a powerful visual-thinking tool that helps clarify and organize ideas and information (Plotnick, 1997; Scappaticci, 2000). These features can help the student with learning difficulties understand how ideas are connected, grouped, and organized. The software reinforces student understanding as they re-create in their own words. The graphic capabilities of Inspiration make an outstanding program for creating visual information (Plotnick, 1997). In fact, Anderson-Inman and Zeitz (1993) encourage users to revise or change the graphics so that the information is personalized. The graphic capabilities of this program make it easy for anyone to customize their work.

Students are able to present their products using a variety of colors, shapes, and graphics (Anderson-Inman & Zeitz, 1993; Scappaticci, 2000).

Student Attitudes Regarding Written Abilities and Word Processing

It would be hard to overemphasize the importance that a student's attitude has upon his/her learning (Gagné, Briggs, and Wager, 1988). Attitudes serve to amplify a person's positive or negative response toward another person, thing, or situation. Gagné et al. (1988) stress that attitude has a significant impact upon performance. To illustrate the importance of a positive attitude toward learning a skill, Gagné et al. (1988) pointed out that a "positive student attitude" is often listed as an educational goal.

Feelings of low self-esteem prevail with students who have mild disabilities. When asked, students with mild disabilities seldom report imagining themselves as good writers. Negative experiences manifest a sense of anxiety, causing these students to avoid written expression whenever possible (Sturm & Rankin, 1997; Zhang, 2000). They are not motivated to write and only do so with reluctance (Bridges, 1996; MacArthur et al., 1995; Morocco & Neuman, 1986; Outhred, 1989).

It is clear that student attitude and motivation are important variables in determining the extent to which students are willing to engage in academic tasks (Anderson-Inman, 1999). Students with disabilities face academic frustration and threat of failure everyday of their academic lives. It is not surprising that they often are advised to, or choose to, engage in academic tasks and coursework that does not expose them to the same high academic standards as their normally achieving peers when given the choice. Their frustration and poor self-confidence guides them toward the path of least frustration. However, it also deprives them of the same level of strategy instruction and

academic preparation as other students. Anderson-Inman (1999) stresses students with poor writing skills should be encouraged to engage in academic endeavors that challenge and motivate them. She theorizes that when students are supplied with computers and strategies to minimize their disabilities and maximize their strengths, they were motivated to test their potential.

Kahn (1988) explored the experiences of second and third grade writers as they learned to write with a word processor over a two-year period. She found an important interaction between the practice of writing with a word processor and theories the students seem to have about the nature of and the activity of writing itself. Word processing made the production of professional-looking documents without spelling and punctuation errors less laborious and time-consuming. Over time, Kahn found that word processing helped children who had been preoccupied with print production and this shifted the focus to actual writing. At the same time, word processing made it possible for young writers to follow through on their evolving theories of writing because adding to, inserting into, and deleting from initial text was easy to accomplish. These shifts in the student's theories of writing were not simply reflected in their positive perception of using a word processor. The attitude of the adults who worked with them and changes that developed in the structure of student's learning opportunities played critical roles in the process.

MacArthur et al., (1991) interviewed twenty-nine students with learning disabilities (LD) and normally achieving (NA) students about their knowledge of writing and their attitudes about writing. These students were fourth, fifth, seventh, and eighth graders. MacArthur et al. explored the students' confidence in responding to common

writing tasks and basic writing processes. The students were asked to respond to questions concerning the characteristics of good writing, how to plan and revise, how to rewrite, and how to address difficulty with writing. The results revealed that normally achieving students were more knowledgeable about the writing process than their counterparts with LD. The NA students were more likely to concentrate on more substantive issues, while the LD students concentrated on the mechanical factors. Another interesting finding of this study was that both groups expressed positive attitudes about writing. However, younger students were more positive about writing than older students. Also of interest was that the NA and the LD students were equally confident in their writing capabilities.

The use of a word processor has shown to lead to a significant decrease in writing anxiety and an increase in self-reported positive attitude for postsecondary students with learning disabilities (Raskind & Higgins, 1998). In this three year study, student questionnaire responses indicated an increase in positive attitudinal responses. 80 percent of the students reported that they felt better about themselves. Almost half of the students reported that computers had enabled them to accomplish tasks they had considered impossible before. One third of the students declared that they could not have made it without access to technology. Raskind and Higgins (1998) concluded the use of technology had a positive influence upon student attitudes.

Summary

Written expression is one of the most complex language tasks students have to undertake during their academic careers. The level of individuals' writing abilities can impact them throughout their lifetime. Their writing competencies affect their lives at

school, at home, and at their job. Persons with mild disabilities tend to show deficits in all stages of the writing process: planning, translating, and reviewing, as well as the grammatical components. Graham et al. (1991) and Zhang (2000) state that students with mild disabilities seldom produce written work even close to the quality of their normally achieving peers, so the question is what can be done to change that situation? What has been proven to work and what needs to be explored? The indications are that students with disabilities do not have adequate knowledge to determine the proper content for written work (MacArthur et al., 1995) and lack the basic information concerning strategies and when to implement them (Deshler et al., 1984; Graham et al., 1991; Newcomer & Barenbaum, 1991; Torgesen et al., 1994, Wong, 2000). Scruggs and Mastropieri (1993) suggest that the most effective strategies need to be determined and taught to students with mild disabilities. This is a journey that is yet to be completed--which are the best strategies to use, for whom, and in what situation?

The literature supports the idea that students with mild disabilities are lacking in their knowledge of effective writing strategies that they can utilize, independent of, or along with technology. To help these students overcome their writing difficulties, strategies must be taught that engage them in writing practice as often as possible (First et al., 1995; MacArthur et al., 1995; MacArthur et al., 1991). While no one strategy will solve all problems for all students, strategies that utilize visual skills and enhance organization appear to hold promise of being effective in the enhancement of writing abilities for students with mild disabilities. Story webbing is one strategy that utilizes visual techniques to facilitate the organization of student's thoughts and ideas into written format (Avery et al., 1996; Guastello, 2000; James et al., 2001; Schewel, 1989). Many

students who struggle with their writing experience difficulty at the prewriting phase, (De La Paz & Graham, 1997; Hunt-Berg et al, 1994; and MacArthur & Graham, 1987). According to Edyburn (2000) teachers report organization skills as a primary area or deficiency for students with mild disabilities, and Supon (1998) suggests that teachers should emphasize visuals and visualizations for student with mild disabilities. Research has yet to be reported which includes a comparison group and intervention group using story webbing, supplemented with daily technology usage, and visual thinking software specifically to support the planning stages of writing for student with mild disabilities.

Technology has shown to be helpful to people with learning disabilities (Bryant & Bryant, 1998; Lewis, 1998a; Okolo et al., 2000) it allows the user to develop compensatory skills that help bypass the area(s) of deficiency (Bowser & Reed, 2000; Bridges, 1996; Bryant & Bryant, 1998; Bryant et al., 1998; Lewis, 1998a; McGregor & Pachuski, 1996; Okolo et al., 2000) and capitalize on strengths (Bryant & Bryant, 1998; McGregor & Pachuski, 1996). The effectiveness of using technology to support writing has been demonstrated by numerous researchers (Bangert-Drowns, 1998; Bridges, 1996; Bryant et al., 1998; Graham & MacArthur, 1988; Lewis, 1998b; MacArthur et al., 1991; Outhred, 1989), devices such as word processors, talking computers, speech recognition systems, spelling checkers, and other educational software, have been used to foster academic success and independence (Bryant & Seavy, 1998). Technology can increase the motivation to write and offers compensator support for students with disabilities, and story webbing is available as a software program. The strategy of story webbing can be paired with technology to assist in planning writing activities through the use of visual

thinking software. There is limited research on story webbing at the planning stage and none found integrating technology on a daily basis.

Finally, students' attitudes are crucial. When only failure is experienced, students develop strategies of avoidance. Conversely, when students experience success, they seek strategies for continued success. Ultimately, students' attitudes provide the underpinning for success or failure. As Gagné et al. (1988) declared, attitudes amplify a person's positive or negative response toward another person, thing, or situation. Negative experiences manifest a sense of anxiety, causing these students to avoid written expression whenever possible (Sturm & Rankin, 1997; Zhang, 2000). They are not motivated to write and only do so with reluctance (Bridges, 1996; MacArthur et al., 1995; Morocco & Neuman, 1986; Outhred, 1989). Technology usage is widely considered to be a motivational tool. Research was not located which teamed story webbing, visual thinking software and daily technology usage in an effort to improve student performance in written assignments.

CHAPTER 3: METHODOLOGY

Overview

The research questions presented in this study were best answered by a mixed methods research design. The study was quasi-experimental in design due to the lack of randomization of the initial group. Essentially, students with mild disabilities were divided into two groups: an intervention group and a comparison group. Students in the intervention group were taught to use story webbing and visual thinking software while students in the comparison group practiced writing skills daily without being taught the strategies. Comparison information was gleaned from the *Test of Written Language 3rd edition* (Hammill & Larsen, 1996), T-units, word count, character count, and student surveys. Student interviews provided data regarding student attitudes toward writing, computer usage, and writing strategies. Additionally, instructor observations provided information concerning how students approach the task of producing written language.

Research Setting

This study took place during a four-week summer remedial project, conducted on a university campus in the south central United States. The project was designed to concentrate on improving academic skills, with an emphasis on written expression. Actual data collection occurred in a classroom on the campus. This classroom was well lighted with comfortable central air conditioning to provide appropriate environmental conditions. Students were seated at large tables, with a total of nine students in the classroom during academic instruction. There was one instructor for every three students. Chalkboard, projection screen, overhead projector, television and video tape recorders were considered standard equipment. The academic portion of this project was thematic

in design with various academic skills being utilized, however there was a definite emphasis on written expression. Additionally, technology usage was integrated into academic activities in a variety of ways, including Internet searches, information graphing, note taking, report writing and daily writing assignments. Each student was assigned an individual laptop computer for the completion of all assignments.

Participants

The participants in this study included 18 students with mild disabilities from four urban middle schools: 16 were eighth grade students and two were seventh grade students. Originally there were 22 students, however due to attrition, within the first few days that number fell to 18, all of whom participated fully for the remainder of the study and for whom data was gathered. All students were identified by their school district and their parent/guardian as having a mild disability in at least one of the core academic areas of reading, written expression, or mathematics. Students scored an average grade equivalence of 5.4 on their spontaneous written expression before the project began, according to the *Test of Written Language 3rd edition (TOWL-3)*. This grade equivalence represents a level of functioning one and one-half to two and one-half years below their expected performance. Participants met four times a week for a period of four weeks; resulting in a total of 16 days. Table 1 provides details of the information gathered from the Student Demographic Survey (Appendix A).

Three certified teachers, with six to 30 years experience, were the instructors for this study. These three instructors delivered instruction to all students. Two of the instructors were certified in the area of Special Education, and the third instructor had

experience working with students who have mild disabilities within the general classroom environment.

Instruments and Measures

The following instruments and measures were used to assess changes in participants' written language and attitudes: Spontaneous subtest from the *Test of Written Language-3*, T-unit evaluations, word count, character count Student Attitudes Survey, Student Interviews Questionnaire and Instructor Observation Logs.

Table 1

Student Demographics

		Number	Percentage
Gender			
	Males	12	67%
	Females	6	33%
Grade			
	Eighth	16	89%
	Seventh	2	11%
Age			
	Fourteen	7	39%
	Thirteen	8	44%
	Twelve	3	17%
Ethnicity			
	African American	6	33%
	American Indian	1	6%
	Caucasian	8	44%
	Hispanic	3	17%

Measures of Written Language

Test of Written Language - 3rd edition

The spontaneous subtests from *Test of Written Language 3rd edition (TOWL-3)* (Hammill & Larson, 1996) were used to examine the changes in student writing before intervention, during the intervention, and after intervention. Differences in writing between the intervention and the comparison groups were also examined. The *TOWL-3* is a standardized instrument designed to measure the quality of written expression and determine proficiency in the conventional, linguistic, and cognitive components of the written composition of students from ages 7 to 17. The *TOWL-3* is effective in assessing a student's written language performance, and determining strengths and weaknesses in written language (Jacobson, 1991; Yarger, 1996).

The *TOWL-3* is composed of contrived and spontaneous formats. The contrived format is designed to determine the student's abilities regarding specific elements that constitute writing, and focuses "on the isolated evaluation of the smallest units of written discourse, such a spelling, capitalization, punctuation, and word usage" (Hammill & Larson, 1996, p.4). The spontaneous format is designed to gather information regarding a student's functional writing ability. The spontaneous format is also referred to as essay-analysis assessment, as it "focuses on evaluating skills relating to the components in terms of their relationship to an actual passage generated by a student" (Hammill & Larson, 1996, p.4). The spontaneously produced essay most closely corresponds with the level of everyday writing generated by a student. In this study, only the subtests from the spontaneous format were used, thereby keeping the focus on the functional written language product rather than components in isolation.

The *TOWL-3* was selected because it provides a quantitative, well-standardized method to assess written performance. There are three subtests designed to assess the spontaneous writing composite of the *TOWL-3*. These subtests are contextual conventions, contextual language, and story construction. Contextual convention measures capitalization, punctuation, and spelling. Contextual language measures vocabulary, grammar, and syntax. Story construction measures sequencing, plot, story beginning and ending, and character development. Of the subtests, story construction most closely parallels the focus of this study.

Reliability of the TOWL-3. There are four types of reliability information presented in the *TOWL-3* manual: coefficient alpha, alternative forms, test-retest, and interscorer differences. The coefficient alpha, the extent to which test items correlate with one another, ranged from .70 to .90. Alternative forms reliability examines the degree to which two forms of the test are equivalent are the focus of alternative forms reliability (Hammill & Larson, 1996; Sattler, 1992). The correlations between the two forms are .80 or higher, with the exception of Contextual Conventions, for which there was a correlation of .71 (Hammill & Larson, 1996, p. 58). Test–retest, or time sampling reliability, examines the extent to which a student's test performance is consistent over time and repeated measurements (Hammill & Larson, 1996; Sattler, 1992). The mean reliability for the spontaneous composite subtests falls between .75 and .85. The *TOWL-3* manual reports the mean interscorer coefficients, refers to the consistency with which various different scorers evaluate student performance, on the Spontaneous Writing Composite to be .92 (Hammill & Larson, 1996, p. 62).

Reliability coefficients of .80 and higher are generally considered acceptable (Sattler, 1992). A summary of the *TOWL-3* reliability coefficients indicate a mean score of .90 for Spontaneous Writing Composite, .82 for Contextual Conventions, .84 for Contextual Language, and .85 for Story Construction. Therefore, the *TOWL-3* should be considered to show evidence of adequate reliability (Bridges, 1996; Hammill & Larson, 1996; Yarger, 1996).

Validity of the TOWL-3. The validity of a test refers to the extent to which a test measures what it says it measures (Bridges, 1996; Hammill & Larson, 1996; Sattler, 1992). The *TOWL-3* manual offers evidence of content validity, criterion related validity, and construct validity. Content validity refers to whether the items on a test are actually representative of what is being measured (Hammill & Larson, 1996: Sattler, 1992). The *TOWL-3* manual offers three demonstrations of content validity with evidence of little or no test item bias shown. Criterion-related validity refers to the extent that a test has been validated in relationship to an outside criterion (Hammill and Larson, 1996, Sattler, 1992). The *TOWL-3* manual offers a correlation between the *TOWL-3* values and the writing skills of the Comprehensive Skills of Student Abilities, which yields an overall Simultaneous Writing Composite of .50 (Hammill & Larsen, 1996, p. 73). Construct validity refers to the extent to which a test measures a theoretical construct and not some other characteristic (Hammill & Larsen, 1996: Sattler, 1992). Hammill and Larsen (1996) identified seven basic traits they believe to account for test performance, developed hypotheses based on these traits, and then verified these traits. The traits are age differentiation, subtest interrelationships, group differentiation, and relationship to academic achievement, relationship to intelligence, factor analysis, and item validity.

In view of the reliability and validity information described above, the *TOWL-3* demonstrates acceptable validity and reliability (Yarger, 1996). The *TOWl-3* appears to meet the qualifications of a standardized test with the characteristics necessary to evaluate the written language performance of the students in this study.

Minimal Terminal Units

Minimal terminal unit (T-unit) counts were used as a second evaluation measure to evaluate both the quality and the quantity of student writing performance. T-unit analysis yields information regarding changes in the syntactic complexity of student products such as when students mature, their sentences increase in length and complexity (Brodney, Reeves & Kazelskis, 1999; Hunt, 1964; Loban, 1976; Nippold, 1998; Scott & Windsor, 2000). A T-unit procedure can be used to overcome many of the syntactic and punctuation errors that frequently occur with inexperienced writers (Brodney et al., 1999; Polio, 1997) because these errors are ignored when evaluating T-units.

Hunt (1964) coined the term T-unit in the mid 1960's as a result of his dissatisfaction with the measurement procedures commonly used in evaluating student writing performance. Traditionally, a sentence might be considered anything that a student writes between two end punctuation marks. However, Hunt argued that it is commonly accepted that many immature writers do not use punctuation well or perhaps not at all. Hunt defined a T-unit as an independent clause and its dependent clause(s).

T-units were a more satisfactory measure of the complexity of a student's written performance because it ignores the punctuation errors so prevalent in the writing products of students with mild disabilities. Hunt conceptualized the idea of evaluating the shortest segments which could be grammatically allowable to write with a capital letter at one end

and a period at the other. He declared, "Fourth graders simply do not use periods and capital letters" (p. 18). Hunt provided the following example of a passage by a fourth grade writer:

> I like the movie we saw about Moby Dick the white whale the captain said if you can kill the white whale Moby Dick I will give this gold to the one that can do it and it is worth sixteen dollars they tried and tried but while they were trying they killed a whale and use the oil for the lamps they almost caught the white whale. (Hunt, 1964, p. 30)

When conversion rules were applied, the 68 word passage was represented quantitatively as 6 T-units. Back slashes indicate the end of each T-unit.

> I like the movie we saw about Moby Dick the white whale/ The captain said if you can kill the white whale Moby Dick I will give this gold to the one that can do it/ (and) It is worth sixteen dollars/ They tried and tried/ (but) While they were trying they killed a whale and use (d) the oil for the lamps/ They almost caught the white whale./ (Hunt, 1964, p. 30)

Table 2 outlines the rules for evaluating T-units and specific directions for determining the T-unit counts per passage.

Word and Character Counts

According to Isaacson (1996), the count of total words is an efficient method to compare a student's fluency between products. For this study, both character count and

word count were used as measures of quantity of writing. Both counts were used in an effort to eliminate issues regarding the length of any particular words that the students chose to use. For example, a student might use the word "considerate" which equals 1 word or 11 characters, compared to the word "kind" which equals 1 word or 4 characters.

Table 2

Rules for Evaluating and Counting T-units.

Rules for evaluating T-units:

- one main clause plus any subordinate = 1 T-unit
- simple or complex sentence = 1 T-unit
- compound sentence = 2 T-units
- punctuation is ignored

To obtain a T-unit count for a passage:

- section off all T-units
- count the total number of T-units

Measures of Student Attitudes

Student Attitudes Survey

A student survey, named the Student Attitudes Survey (SAS) (Appendix B) was developed based upon information gleaned from literature reviews and several drafts with feedback from knowledgeable faculty. The SAS included two practice questions to be completed with teacher instructions, and a total of 12 additional questions that the student answered individually. Questions 1, 4, 8, and 11 address attitudes regarding writing, questions, 2, 5, 7, 10, and 12 address attitudes regarding writing strategies, and questions,

3, 6, and 9 explored attitudes regarding computer usage. Questions 2 and 8 are reverse coded because they are negatively stated.

Participants completing the SAS were asked to respond to the level they agree or disagree with each statement on the SAS. A six-point Likert scale of equal interval responses is used (6=strongly agree, 1=strongly disagree) to represent the extent to which a student holds a belief or feeling. According to Babbie (1975), a six point scale is beneficial because it requires the participant to respond toward the positive or the negative side, allowing no neutral point.

Student Interview Questionnaire

The student attitudes were measured during a structured individual interview. The Student Interview Questionnaire (SIQ) (Appendix C) was developed after reviewing key issues from the literature and receiving feedback from several knowledgeable faculty in the field. As suggested by Babbie (1975), questions were open-ended, which would allow for probing for clarity and completion of answers (Rubin & Rubin, 1995). Surveys were designed to gather independent responses from students at pre-intervention and post-intervention intervals.

The questions on the SIQ were similar to the questions administered on the SAS. This similarity was especially important because research provides some evidence that students with mild disabilities often have a distorted picture of their written language abilities (MacArthur, Schwartz, & Graham, 1991). The correlation between the questions on the SIQ and the SAS were purposely designed to glean information to similar questions from two difference sources. The SIQ included 12 questions: four about writing strategies, five about student attitudes about writing, and three about computer usage.

Instructor Observation Logs

An Instructors' Observation Log was maintained daily. The format of the Instructor Observation Logs in this study were similar to what Creswell (1998) calls field notes; the instructors simply recorded what they observed, and made notations or comments they considered appropriate. Entries emphasized behaviors that reflect student attitudes and academic performance. Additionally, instructors documented their observations regarding student approach to individual assignments, and any writing strategies used by students.

Materials and Software

Story Webbing

The writing strategy of story webbing is a method of visually representing ideas, concepts, or events and their relationship to one another (Figure 1). Story webs provide structure for ideas and facts, and help students organize information (Bailey et al., 1995), especially at the pre-writing stage (First et al., 1995). This type of writing technique is believed to hold promise for students with learning disabilities because of the visual representation of thoughts and concepts (Avery et al., 1996; Guastello, 2000; James et al., 2001; Schewel, 1989). Materials used to train instructors and students include story web instructions, story web sample, and story web worksheet. These materials can be found in Appendices D, E and F, respectively.

Inspiration

As described in the Review of Literature, Inspiration is a powerful visual-thinking software program that helps users clarify and organize ideas and information (Plotnick, 1997; Scappaticci, 2000). This program is also referred to as a graphic

organizer because it allows the user to create a visual display, or story web, and then organize ideas into a meaningful format when planning writing responses. Organization of concepts, ideas, and brainstorming of ideas are strengths of Inspiration. The graphic capabilities of the program make it especially interesting to use and helpful with visual organization, as well as presentation (Anderson-Inman and Zeitz, 1993). This program also allows users to choose from a variety of styles, shapes, graphics, and colors to personalize their work.

Microsoft Word

One of the most popular word processing programs available is Microsoft Word. It can be used on the Windows based or the Macintosh platform, and is widely used in homes, schools, and businesses. This word processing program has many standard features that serve as writing tools, for example spelling and grammar checks, dictionary, and thesaurus.

Type to Learn

The keyboarding program Type to Learn (Sunburst, 1996) is designed for students from age 8 to 14 and provides keyboarding instruction and practice reinforced by games and speed-building activities. It provides intense practice of skills for approximately 10 minutes, followed by a reward session in a video game format which provides additional reinforcement for the skills just learned. In addition, this software program offers data that is beneficial in tracking and documenting student progress. The program can be customized to fit the needs of each individual. Well developed keyboarding skills are crucial to influencing how much benefit students will reap from having technology tools at their disposal (Espin et al., 2000; Lewis, 1998a; Outhred, 1989). If students do not

have the skills to use the tools, it can actually serve as a burden to the student rather than a support.

Role and Training of Instructors

Three instructors, all of whom were all certified teachers with 30, 16 and 6 years teaching experience, worked with students for the duration of this study. Two of the instructors were certified in the area of special education, and the third teacher had a great deal of experience working with students with mild disabilities in her general education classroom.

The three instructors planned, delivered, and managed all academic components of the study for both groups. This was purposeful in design to assure consistency in academic experiences for both groups. The only differences in academic content or activities were in the instruction of story webbing strategies and visual thinking software, which were targeted intervention activities. The same three instructors were used with both groups to decrease the chances that other differences between groups, not attributable to planned intervention activities, would occur.

Prior to the study, instructors were taught the techniques of story webbing using, which was the same format they would in turn use to teach story webbing to students. All three instructors were also taught to generate story webs using the visual thinking software, Inspiration.

Procedures

Pre-Intervention

Before the first day of the study, a parent or guardian of each participant read and signed an informed consent form, giving approval for their son or daughter to participate

and be video taped (Appendix D). Upon receiving parental permission, and prior to beginning the study, students signed an informed assent form allowing for their participation and video taping during this study (Appendix H).

Week One

Day 1. All students completed the Demographic Information Sheet (Appendix A) and the Student Attitudes Survey (SAS) independently (see Table 5). Based on this data, students were placed in rank order according to information such as: gender, age, grade, and use of computer. Next, students were alternately assigned to the intervention group or the comparison group. Purposeful selection of groups was used in an attempt to assure the highest possible degree of equality between groups.

The instructors then explained that the academic activities for the study centered on the theme of the rainforest, and emphasized written language. Students were told that they would be conducting research, much of it on the Internet, to make a presentation about a rainforest mammal, reptile, or amphibian. Thematic units would include math, social studies, science skills, reading, writing, and technology activities. However, students were told there would be an emphasis on written expression and technology usage. All academic activities revolved around the theme of the rainforest.

The first day concluded with all students completing a handwritten pretest using Form A of the *TOWL-3* (Appendix I). Laptops were not used during this handwriting pretest. Students were allowed to complete their writing at their own pace. None exceeded 25 minutes. The instructions for administering the spontaneous writing composite of the *TOWL-3* were modified to fit the audience and the intended task. The script for administering the writing prompt can be found in Appendix J. This script was

used by all instructors during daily writing prompts for the remainder of the study to assure that all students, in both groups, received identical information.

Instructor Observation Logs entries emphasized student behaviors and performance, especially during writing activities. Instructor Observation Logs were maintained daily, by all three instructors, throughout the entire 16 days of the study.

Day 2. After a brief opening activity for the entire group, students were separated according to their assignment to the intervention or the comparison group. The Student Interview Questionnaire (SIQ) was administered as a pretest to all students however, for the purposes of this study, information from the students in the intervention group were the only responses utilized. Each student was interviewed privately using the SIQ.

Students were assigned a specific laptop computer for their use throughout the study as an educational tool. The assignment to a specific computer allowed students to store information on the computer, and gain a sense of familiarity with a particular computer. Student laptops were labeled using names of reptiles, amphibians, birds, and mammals derived from the rainforest theme, such as "Scarlet Macaw." Instructors demonstrated several key features on the laptops and then students were given a variety of activities to complete designed to familiarize students with their computers. During the 30 minutes allowed, students were asked to make a personal file for the desktop, type an entry using the word processor, change font size and color, and then print a document.

The second day concluded with all students completing a word processed writing sample as a second pretest (Appendix K). Students were allowed to write, using their laptops, until finished. None exceeded 25 minutes. Students used their laptops, which were MAC G3 PowerBooks, and the word processing program Microsoft Word 2000.

This pretest was in contrast to the handwritten sample pretest from day one. Various features on the laptops, such as spell check, were demonstrated and made available for students to use throughout the study if they desired.

Intervention

Writing activities, intervention activities, and data collection for weeks one through four are presented in Tables 3, 4, 5, and 6 respectively. General assignments from the thematic unit and social activities are not included in these tables.

Week One

Day 3. All students were introduced to, and began their daily use of, the keyboarding software program, Type to Learn, with a 15 minute activity. Students were told that they would engage in keyboarding practice, using Type to Learn, for the remainder of the study for approximately 15-20 minutes daily.

Students in the intervention group were introduced to the concept of story webbing. The group then composed a story web together. Next, each student was given their daily writing prompt and a story webbing worksheet (Appendix F), and told they had 10 minutes to individually compose a story web to go with their daily writing prompt. The students in the comparison group were not taught story webbing, they responded to their daily writing prompts simply by practicing writing daily. However, they received the same academic instructions with the exception of any instructions regarding story webbing. The writing prompts used throughout the study alternated between visual prompts and verbal story starter prompts. This was done to reduce the influence of either method, as this was not a consideration for this study. Identical prompts and evaluations were used for students in both groups. Instructors continued to

administer all writing prompts using scripted instructions throughout the study (Appendix J).

Day 4. Students were given their daily writing prompt with instructions to write until finished, not to exceed 25 minutes. Students in the intervention group were asked to generate a story web to help plan their written response, while students in the comparison group were simply asked to generate their responses to the daily story prompt. Students were allowed to use the story webbing worksheet to generate their story webs.

Table 3

Week 1: Summary of Intervention Activities and Data Collection.

Intervention Group	Comparison Group
Day 1 Demographic Information Pretest - Handwritten SAS administered	Day 1 Demographic Information Pretest - Handwritten SAS administered
Day 2 Pretest – Word Processed SIQ administered	Day 2 Pretest - Word Processed SIQ administered
Day 3 Instruction, demonstration, usage of story webbing with daily writing prompt Type to Learn keyboard practice	Day 3 Writing prompt no story webbing Type to Learn keyboard practice
Day 4 Writing prompt using story webbing Type to Learn keyboard practice	Day 4 Writing prompt no story webbing Type to Learn keyboard practice
Instructors' Observation Log maintained daily.	Instructors' Observation Log maintained daily.

Week Two

Day 5. The intervention group generated story webs using the story webbing worksheet for their daily writing prompt, while the students in the comparison group simply wrote their responses. After the daily prompted writing activity, participants in the intervention group were taught to generate story webs using the software program Inspiration, version 5. They watched as the instructor demonstrated how to use the software, and then the group generated a story web together with the instructor at the computer. Next, students individually replicated the story web they had generated by hand earlier during their daily writing prompt activity, using the software program Inspiration.

Day 6. Instructors presented a reminder of how to build a story web using Inspiration to the entire intervention group. Next, students built a story web as a group using Inspiration, with each student generating the group story web individually at their laptop. Assistance and feedback were offered by the instructors as needed. Following group practice, each student individually generated a story web for their own daily writing prompt using Inspiration, with instructors providing assistance as needed. It is important to note that from day six forward, Inspiration was used for story webbing by the intervention group, while the comparison group continued to produce their writing responses without any story webbing instruction. Instructor Observation Logs and keyboarding practice were continued every day.

Day 7. Students were given their daily writing prompts and students from the intervention group were asked to generate a story web using Inspiration before writing their responses to the prompt.

Table 4

Week 2: Summary of Intervention and Data Collection Activities.

Intervention Group	Comparison Group
Day 5 Writing prompt story webbing Taught Inspiration for story webbing Type to Learn keyboard practice	Day 5 Writing prompt w/ no story webbing Type to Learn keyboard practice
Day 6 Reminder with group activity using Inspiration Writing prompt with Inspiration Type to Learn keyboard practice	Day 6 Writing prompt with no story webbing Type to Learn keyboard practice
Day 7 Writing prompt using Inspiration Type to Learn keyboard practice	Day 7 Writing prompt with no story webbing Type to Learn keyboard practice
Day 8 Mid test writing using Inspiration Type to Learn keyboard practice	Day 8 Mid test writing no story webbing Type to Learn keyboard practice
Instructors' Observation Log maintained daily.	Instructors' Observation Log maintained daily.

Day 8. A test at the mid point of the intervention, called a "mid test" writing sample, was given to all students in both groups using a verbal story starter prompt. The students were allowed to produce their mid test in handwritten form or word processed form--all students in both groups chose word processing. Students in the intervention groups generated a story web using Inspiration before writing their response.

Week Three

Days 9 and 10. The daily assignments for days 9 and 10 remained the same, the comparison group continued to complete daily writing assignments without any

instruction regarding story webbing, while the intervention group completed their daily writing assignments using Inspiration to generate story webs. Keyboarding practice using Type to Learn continued for both groups, with all students practicing keyboarding skills for approximately 15-20 minutes daily.

Day 11. Students in both groups were given Form B of the *TOWL-3* which provided a picture prompt (Appendix L). This writing activity yielded the posttest handwritten writing sample. Upon receipt of the Form B writing prompt, the instructors read the scripted instructions (Appendix J) to both groups. However, students in the intervention group were also instructed to plan their writing response using Inspiration. After posttest activities, students engaged in daily activities, including keyboarding practice.

Table 5

Week 3: Summary of Intervention and Data Collection Activities.

Intervention Group	Comparison Group
Days 9 & 10 Writing prompt using Inspiration Type to Learn keyboard practice	Days 9 & 10 Writing prompt using no story webbing Type to Learn keyboard practice
Day 11 Posttest HW using Inspiration Type to Learn keyboard practice	Day 11 Posttest HW using no story webbing Type to Learn keyboard practice
Day 12 Posttest WP using Inspiration Type to Learn keyboard practice	Day 12 Posttest WP using no story webbing Type to Learn keyboard practice
Instructors' Observation Log maintained daily.	Instructors' Observation Log maintained daily.

Note. Handwritten = HW; Word Processed = WP

Day 12. A similar picture prompt to the one on Form B of the *TOWL-3* was given to the students to serve as a prompt for their posttest word processed writing sample (Appendix M). Upon receipt of their writing prompt the intervention group was told to plan their writing response using Inspiration. Writing responses were produced on the MAC PowerBooks. Students engaged in daily activities, including keyboarding practice, after completion of their posttest.

Post-Intervention

Week Four

Day 13. Students from the comparison group received instructions on how to make a story web. The comparison group then composed a story web together, after which each student was given their daily writing prompt and a story webbing worksheet and told they had 10 minutes to compose a story web to go with their daily writing prompt. The students in the intervention group continued to generate their story webs using Inspiration for their daily writing prompts.

Daily activities involving keyboarding practice using Type to Learn proceeded as normal. The day concluded by having students individually respond to the SAS as a posttest instrument. All students participated in completing the SAS however, for the purpose of this study, only the responses by the students in the intervention group will be utilized a this point because the intervention group was taught story webbing and to use visual thinking software.

Day 14. The comparison group generated story webs by hand for their daily writing prompt then they were taught to generate story webs using the software program Inspiration. They watched as the instructor demonstrated how to use the software, and

then the comparison group generated a story web together with the instructor at the computer. Next, students individually replicated the story web they had generated by hand earlier during their daily writing prompt activity, using the software program Inspiration. Students in the intervention group practiced story webbing using Inspiration.

Students were individually interviewed using the SIQ as a posttest instrument. Answers were recorded and video taped for accuracy. Like the SAS responses, for the purpose of this study, only the responses of students in the intervention group were utilized.

Day 15. Instructors presented a reminder of how to build a story web using Inspiration to the entire comparison group. After the instruction was completed the students built a story web as a group using Inspiration, with students generating their own story web individually at their laptop. Assistance and feedback was offered by the instructors as needed. Following group practice, each student individually generated a story web for their daily writing prompt using Inspiration; again instructors provided assistance as needed. Students in the intervention group practiced their writing using Inspiration as a writing tool. Instructor Observation Logs and keyboarding practice using Type to Learn continued.

Day 16. A second posttest, or post- posttest, for written performance was given using a verbal story starter as a writing prompt. All students, in both groups, used story webbing techniques on the Inspiration software program. As with the mid test, students were given the choice of producing their written response in handwriting or as a word processed product; all students chose to word process their writing sample, using their laptops.

Table 6

Week 4: Summary of Intervention and Data Collection Activities.

Intervention Group	Comparison Group
Day 13 Writing prompt using Inspiration Type to Learn keyboard practice Post SAS	Day 13 Taught story webbing Writing prompt using story webbing Type to Learn keyboard practice Post SAS
Day 14 Writing prompt using Inspiration Type to Learn keyboard practice Post SIQ	Day 14 Taught Inspiration for story webbing Writing prompt using Inspiration Type to Learn keyboard practice Post SIQ
Day 15 Writing prompt using Inspiration Type to Learn keyboard practice	Day 15 Writing prompt using Inspiration Type to Learn keyboard practice
Day 16 Post-posttest with Inspiration for story webbing	Day 16 Post-posttest with *Inspiration* for story webbing
Instructors' Observation Log maintained daily.	Instructors' Observation Log maintained daily.

Data Analysis

The research questions presented in this study were best addressed by a mixed methods quasi-experimental research design. Statistical data was generated using the scores of the following measures: spontaneous subtests from the *TOWL-3*, T-unit counts, word counts, character counts, and the Student Attitudes Survey (SAS). The Student Interview Questionnaire (SIQ) yielded descriptive data regarding student knowledge, attitude, and previous writing experiences. In addition, daily Instructor Observations

Logs provided descriptive data regarding how students approached the task of producing written language.

Table 7 provides a list of dependent and independent variables. The independent variables were story webbing, generated by hand or Inspiration, and no story webbing. The dependent variables were the spontaneous subtests from the *TOWL-3*: Contextual Conventions, Contextual Language, and Story Construction; the *TOWL-3* spontaneous subtests composite scores; the *TOWL-3* quotient scores; T-unit counts; Word Counts; Character counts; and SAS. Additional sources of data were the SIQ and the Instructor Observation Logs.

Table 7

Lists of Independent and Dependent Variables from the Study.

Independent Variables	Dependent Variables
Story webbing instruction	Quality of Spontaneous Writing *(TOWL-3)*
	Contextual Convention Scores
No story webbing instruction	Contextual Language Scores
	Story Construction Scores
	Composite Scores
	Quotient Scores
	T-unit Counts
	Word –Character Counts
	Student Attitude Survey

Note. Test of Written Language – 3rd edition = TOWL-3

Descriptive Analysis

Descriptive qualitative information was gleaned from the SIQ (see Table 8). Information from the SIQ was grouped according to the dimensions of attitudes

concerning writing, computer usage, and writing strategies. Comparisons were made between student responses at the pretest and the posttest intervals. Also, descriptive qualitative information was gathered from the Instructor Observation Logs regarding observations made by the three instructors in the study regarding student behavior and performance when taught story webbing.

Table 8

Qualitative Data Collection Schedule.

	Pre intervention	Post intervention	Daily
SIQ	x	x	
Instructor Observations			x

Statistical Analysis

This study was a mixed methods research design. Information was gleaned from the five samples of student written language performance (two handwritten samples produced at pretest and posttest, and three word processed samples produced at the pretest, mid test, and posttest intervals) and the SAS (pretest and the posttest intervals) (see Table 10 for details). There were multiple independent variables (IVs) and dependent variables (DVs) considered throughout this study, therefore, multivariate analyses of variances (MANOVA) were conducted to examine the quantitative information. SPSS statistical computer software (Version 11) was used to analyze the data collected. A MANOVA was selected because of its appropriateness when there are many independent variables (IVs) and/or many dependent variables (DVs) that are all

correlated to one another to a degree (Tabachnick & Fidell, 1996). The application of a MANOVA serves to create a new dependent variable from the set of dependent variables, thereby maximizing group differences and increasing the chance that changes as a result of different treatments will be detected. The group intervention or comparison was the between-subjects factor. The with-in subject factor was time. Handwritten samples included pretest and posttest (see Table 9). Word processed samples included pretest, mid test, and posttest.

Table 9

Writing Sample Modality, Prompt Type and Schedule.

	Modality		Prompt	
Schedule	HW	WP	Picture	Verbal
Pretest	x		x	
Pretest		x	x	
Mid test		x		x
Posttest	x		x	
Posttest		x	x	
Post-posttest		x		x
Total	2	4	4	2

Note. Handwritten = HW; Word Processed = WP

Scoring and Inter-scorer Reliability

The analyses of the spontaneous subtests from the *TOWL-3* were complicated and required the scorers to make numerous decisions. Due to the complexity of scores and the subjective nature of the instrument, all three project instructors were trained to score spontaneous writing products using the *TOWL-3* techniques, as well as to count T-units. See Appendices M & N respectively for scoring information. Prior to the beginning of

the study there were two training sessions. Training allowed instructors to become familiar with scoring procedures, evaluate practice samples, and then compared their results to one another. Post data collection inter-scorer reliability results will be reported in chapter four.

Table 10

Quantitative Data Collection Schedule.

	Pretest		Mid test	Posttest		Post-posttest
	HW	WP		HW	WP	
TOWL-3						
Spontaneous Subtest	x	x	x	x	x	x
Composite Score	x	x	x	x	x	x
Quotient Score	x	x	x	x	x	x
T-units	x	x	x	x	x	x
Word Counts	x	x	x	x	x	x
Character Counts	x	x	x	x	x	x

	Pre intervention	Post intervention
SAS	x	x

Note: *Test of Written Language* = *TOWL-3*; Handwritten = HW; Word Processed = WP

Summary

This chapter described the methodologies to be used in this study to investigate the following items: the effects of writing strategies and visual thinking software on the written language performance of students with mild disabilities; student-perceptions regarding written language tasks; and perceived changes in student behavior and performance by instructors. The research design was described and specifics of the methodologies were discussed. The following information was included: type of research and design, research setting, participants, instruments and measures, materials and

software, intervention method, and data analysis procedures. An analysis of the data will be presented in chapter four.

CHAPTER 4: RESULTS

Overview

This chapter reports the results of a study that examined the effects of story webbing and visual thinking software on the written language performance of students with mild disabilities. Additionally, students' attitudes about writing with respect to the interventions that occurred in this study were examined through interviews and data gleaned from the attitude survey. Finally, the perceptions of instructors were gathered on a daily basis. This study anchored around five research questions. These research questions and a summary of the measures and methods of analysis associated with these questions are summarized in Table 11.

Question 1

Research question one asked if there was an increase in the quality and quantity of the written language performance of students with mild disabilities when they were taught story webbing and to use the visual thinking software. The question regarding a possible increase in the quality of written language performance was examined by pretest, mid test, and posttest of the *TOWL-3* scores and T-units of the word processed writing samples of the students in the intervention group. Repeated measures MANOVA were used to analyze data. The amount, or quantity, written was yielded by evaluating the number of T-units, word count and character count of the four computer generated writing samples of the intervention group.

This question examined the differences in written performance when students were taught story webbing. The writing strategy of story webbing served as the independent variable in this question as students were taught to use this strategy first by

Table 11

Data Analysis Summary Chart

Products	Measures/Variables	Analysis Method	Question Addressed
Pretest:	*TOWL-3* (protocols)		
Writing Sample - Handwritten	• Contextual Convention Score	MANOVA / Repeated Measures ANOVA	1,2,3
Writing Sample – Word Processed	• Contextual Language Score		1,2,3
Mid test:	• Story Construction		1,2,3
Writing Sample – Word Processed	• Composite Score		1,2,3
Posttest:	• Quotient		1,2,3
Writing Sample – Handwritten	T-units		1,2,3
Writing Sample – Word Processed	Word Count		1,2,3
Post-posttest:	Character Count		
Writing Sample – Word Processed			
Pre Questionnaire Post Questionnaire	Self-perceptions of • Attitudes ~ Writing • Strategy Information • Computer Skills	Descriptive Analysis	4
Pre Interview Post Interview	Self-perceptions of: • Attitudes ~ Writing • Strategy Information • Computer Skills	Descriptive Analysis	4
Instructor's'Observation Logs	Teacher's perceptions, and observations,	Descriptive Analysis	5

hand and then by using the computer program Inspiration. T-unit evaluations, along with five writing domains from the *TOWL-3 (*Contextual Convention; Contextual Language; Story Construction; Composite Scores; and Quotient Scores) served as the dependent

variables for evaluating changes in the quality of student writing performance. Changes in the amount of written language produced were examined using the number of T-units, word counts and character counts as dependent variables. The five writing samples used for this comparison were the handwritten pretest, the word processed pretest, the word processed mid test, the handwritten posttest and the word processed posttest. An alpha level of .05 was used on all statistical tests to determine statistically significant differences.

Word Processed Writing Products

Simple effect one-way within subject MANOVA were conducted to determine if there was a statistically significant difference in the writing performance of word processed products when students were taught story webbing and to use the visual thinking software Inspiration (see Table 14). Each of the dependent variables were examined the three spontaneous subtests, the composite scores, and the quotient scores from the *TOWL-3,* T-units, word counts, and character counts. There were statistically significant differences found in the T-units, word counts, and character counts, on the pretest, the mid test, and the posttest word processed samples of students. T-units were found to increase by 50% on writing samples produced by the word processor with ($M = 4.0$, $SD = 2.61$) at the pretest interval, ($M = 6.0$, $SD = 1.50$), $F(1, 8) = 7.158$, $p = .021$. Similar findings were evident using the measurement of word count and character count; with word count the MANOVA yielded an increase of 57% in the number of words used between the pretest ($M = 41.78$, $SD = 26.77$) and at the posttest ($M = 65.78$, $SD = 21.33$) yielded a significant difference, $F(1, 8) = 12.135$, $p = .006$. Character count also had an

increase of 57% in the number of characters used between the pretest (M = 176.0, SD = 97.14) and posttest (M = 273.22, SD = 89.08), F (1, 8) = 6.544, p = .025.

There were no statistically significant differences found on the quality of written products when comparing the word processed samples of the students taught story webbing and to use the visual thinking software Inspiration. Their pretest, mid test, and posttest word processed writing samples were evaluated using the three spontaneous subtests, the composite scores, and the quotient scores from the *TOWL-3*. Although the differences were not statistically significant, there were gains in all measures except one. Increases ranged from 8% to 24%, with the exception of the subtest Contextual Convention, which showed a very small decrease in performance of 4% between the pretest and the posttest (see Table 12).

Upon further investigation of variables which displayed a statistical difference on the MANOVA, a within subjects contrast trend analysis was conducted to determine if the changes were linear in their increase (see Table 12). Significant differences continued to be found on all three measures--T-units, word count, and character count, and the change appeared to be linear. This indicates that the increase between the performance at pretest and mid test and between mid test and posttest were similar in change, that is, they increased proportionately. Therefore, statistically significant differences were found in all measures of writing quantity when students were taught the writing strategy of story webbing and to use the visual thinking software Inspiration for planning their writing.

Handwritten Products

When examining the performance of students in the intervention group in the area of quality of writing with the handwritten products gathered at the pretest and the posttest

intervals, there was an increase of 22 to 26 percent (see Table 13). All measures of spontaneous writing on the *TOWL-3* showed statistically significant differences with the exception of story construction, which approached significant differences and actually showed the highest increase in percent gains from pretest to posttest. On the spontaneous subtest of contextual convention there was an increase of 23% in the quality between the pretest (M = 7.28, SD = 2.29) and the posttest (M = 9.0, SD = 2.47), F (1, 8) = 6.283, p = .037. This was particularly interesting because with word processing this is the only subtest where students showed a decline in their scores from pretest to posttest.

On the spontaneous subtest of contextual language there was a 22% increase in the quality between the pretest (M = 6.72, SD = 2.22), and the posttest (M = 8.17, SD = 1.97) yielded a significant difference, F (1, 8) = 12.250, p = .008. On the spontaneous subtest of story construction there was a 26% increase in the quality between the pretest (M =8.61, SD = 2.58), and the posttest (M =1-.83, SD = 3.06), F (1, 8) = 4.364, p = .070. Composite score means increased by 23% in the quality between the pretest (M =22.67, SD = 4.99), and the posttest (M =28.00, SD = 6.23), F (1, 8) = 19.363, p = .002. There was a 14 % gain in quotient scores between the pretest (M = 84.11, SD = 10.56) and the posttest (M = 95.72, SD = 13.45) performance yielded a significant difference,, F (1, 8) = 19.372, p = .002.

Interestingly, when written quantity on the pretest and the posttest of handwriting samples was examined using T-units, word count, and character count, all of these areas showed a decrease of 12 %. This indicates that students actually wrote less at the point of the posttest than they wrote during pretest. This is particularly noteworthy because with

Table 12

Statistical Analysis Results in the Pretest, Mid Test, and Posttest Word Processed Writing Samples of the Intervention Group.

Measures	Mean Scores			MANOVA		Within-Subjects Contrasts Trend Analysis	
	Pretest M (SD)	Mid Test M (SD)	Posttest M (SD)	% Gain	*F*	*p*	*F*	*p*
Quality of Spontaneous Writing (TOWL-3)								
Contextual Convention	9.33 (1.68)	9.17 (.97)	8.94 (1.26)	-4%	.185	.903		
Contextual Language	7.61 (1.95)	7.78 (1.18)	8.44 (1.38)	11%	1.760	.254		
Story Construction	8.33 (2.78)	9.56 (1.89)	10.28 (2.08)	24%	1.374	.338		
Composite Score	25.28 (4.03)	26.50 (2.66)	27.72 (3.33)	10%	.914	.488		
Quotient Score	88.22 (9.54)	92.39 (5.77)	5.00 (7.14)	8%	1.075	.428		
T – units	4.00 (2.61)	6.67 (5.55)	6.00 (1.50)	50%	7.158	.021	20.049	.002
Word Count	41.78 (26.77)	51.78 (22.58)	5.78 (21.33)	57%	12.135	.006	10.658	.011
Character Count	176.00 (97.14)	218.78 (83.91)	273.22 (89.08)	55%	6.544	.025	8.382	.020

Note. Test of Written Language = TOWL-3

Table 13

Statistical Analysis Results for the Pretest and the Posttest Handwritten Writing Samples of the Intervention Group.

Measures	Handwriting			MANOVA	
	Pretest *M (SD)*	*Posttest* *M (SD)*	*Percent gains*	*F*	*p*
Quality of Spontaneous Writing (TOWL-3)					
Contextual Convention	7.28 (2.29)	9.00 (2.47)	23%	6.283	.037
Contextual Language	6.72 (2.22)	8.17 (1.97)	22%	12.250	.008
Story Construction	8.61 (2.58)	10.83 (3.06)	26%	4.364	.070
Composite Score	22.67 (4.99)	28.00 (6.23)	23%	19.363	.002
Quotient Score	84.11 (10.56)	95.72 (3.45)	14%	19.372	.002
T – units	11.31 (5.39)	9.89 (4.34)	- 12%	.077	.788
Word Count	99.44 (55.99)	87.44 (38.31)	- 12%	1.448	.263
Character Count	392.67 (214.34)	345.56 (139.96)	- 12%	1.436	.265

Note. Test of Written Language = TOWL-3

the word processed writing samples the increases were 50% to 57% from pretest to posttest (see Table 14).

Table 14

Mean Scores and Percent Gains for Handwritten and Word Processed Writing Samples Performed at the Pretest and the Posttest Intervals for the Intervention Group (n = 9.)

	Handwritten			Word Processed		
Measures	*M (SD)*		*Percent gains*	*M (SD)*		*Percent gains*
Quality of Spontaneous Writing (TOWL-3)						
Contextual Convention						
Pretest	7.28	(2.29)		9.33	(1.68)	
Posttest	9.00	(2.47)	23% *	8.94	(1.26)	- 4%
Contextual Language						
Pretest	6.72	(2.22)		7.61	(1.95)	
Posttest	8.17	(1.97)	22% **	8.44	(1.38)	11%
Story Construction						
Pretest	8.61	(2.58)		8.33	(2.78)	
Posttest	10.83	(3.06)	26%	10.28	(2.08)	24%
Composite Score						
Pretest	22.67	(4.99)		25.28	(4.03)	
Posttest	28.00	(6.23)	23% **	27.72	(3.33)	10%
Quotient Score						
Pretest	84.11	(10.56)		88.22	(9.54)	
Posttest	95.72	(13.45)	14% **	95.00	(7.14)	8%
T– units						
Pretest	11.31	(5.39)		4.00	(2.61)	
Posttest	9.89	(4.34)	- 12%	6.00	(1.50)	50% **
Word Count						
Pretest	99.44	(55.99)		41.78	(26.77)	
Posttest	87.44	(38.31)	- 12%	65.78	(21.33)	57% *
Character Count						
Pretest	392.67	(214.34)		176.00	(97.14)	
Posttest	345.56	(139.96)	- 12%	273.22	(89.08)	55% *

*Note. Test of Written Language (3rd edition) =TOWL-3; Statistically significant p values of <.05 = *, < .01 = ** .*

Summary

Consequently, when students were taught story webbing and to use the visual thinking software Inspiration, there was a statistically significant difference in the amount of writing they produced when using a word processor. However, there was a decrease in the amount of writing they produced when their products were produced using handwriting. In addition, increases were shown in percent gains between pretest and posttest in all areas regarding the quality of writing when producing writing using a word processor, although those gains were not statistically significant. Conversely, when writing was handwritten, the differences between pretest and posttest, on all measures of writing quality, were statistically significant with the exception of story construction, and even that subtest approached significance with a p value of .070.

Question 2

Research question two asked if there was an increase in the quality and quantity of the written language performance of students with mild disabilities when they practiced their writing skills daily, without being taught story webbing and to use visual thinking software. Increases in the quality of the written language performance were examined by comparing the scores of the word processed writing samples of the students in the comparison group on their pretest, mid test, and posttest *TOWL-3* scores and T-units evaluations. Repeated measures MANOVA were used to analyze the data. The number of T-units, word count and character count of the pretest, mid test, and posttest word processed writing samples of the comparison group yielded information regarding increases in the amount generated and written by students.

Word Processed Writing Products

Simple effect one-way within subject MANOVA were conducted to determine if there was a statistically significant difference in the writing performance of word processed products when students were not taught a specific writing strategy (see Table 15). Each of the dependent variables were evaluated: the spontaneous subtests, composite scores, quotient scores from the *TOWL-3*, T-units, word counts, and character counts. Statistically significant differences were found with all but one dependent variable for evaluating both quality of writing and quantity of writing. Using the *TOWL-3* instrument, the subtest of story construction was found to increase by 53% in quality between the pretest ($M = 7.61$, $SD = 3.22$) and posttest ($M = 11.67$, $SD = 2.57$), $F(1, 8) = 51.729$, $p = .000$. The quotient score yielded an increase of 16% in quality of writing between the pretest ($M = 86.22$, $SD = 14.28$) and posttest ($M = 99.78$, $SD = 16.80$), yielding a significant difference, $F(1, 8) = 4.813$, $p = .015$. In the area of quantity of writing all three instruments yielded significant differences. T-units had an increase of 126% in the quantity between the pretest ($M = 5.50$, $SD = 7.09$) and posttest ($M = 12.44$, $SD = 11.65$), $F(1, 8) = 5.652$, $p = .035$. Word count had an increase of 109% in the quantity between the pretest ($M = 64.56$, $SD = 92.29$) and posttest ($M = 135.00$, $SD = 124.70$), $F(1, 8) = 8.038$, $p = .016$. While character count yielded an increase of 102% in the quantity between the pretest ($M = 269.44$, $SD = 351.44$) and posttest ($M = 544.11$, $SD = 520.95$), $F(1, 8) = 6.714$, $p = .024$. Therefore, all measures of change in writing quantity exhibited increases of approximately 100%.

When a within subjects contrast linear trend test was conducted on the variables which reached levels of statistically significant differences, the p values for all areas

Table 15

Statistical Analysis Results for the Pretest, Mid Test, and Posttest Word Processed Writing Samples of the Comparison Group.

Measures	Mean Scores				MANOVA		Within-Subjects Contrasts Trend Analysis		Within-Subjects Effects (Univariate)	
	Pretest M (SD)	Mid Test M (SD)	Posttest M (SD)	% Gain	*F*	*p*	*F*	*p*	*F*	*p*
Quality of Spontaneous Writing (TOWL-3)										
Contextual Convention	8.22 (1.25)	8.50 (1.58)	8.78 (3.24)	7%	.193	.898				
Contextual Language	7.72 (2.56)	8.28 (2.22)	9.44 (2.89)	22%	4.305	.061	8.385	.020	5.910	.007 †
Story Construction	7.61 (3.22)	9.97 (1.82)	11.67 (2.57)	58%	51.729	.000	57.470	.000		
Composite Score	23.67 (6.74)	26.33 (5.30)	29.89 (7.86)	26%	3.386	.095	10.436	.012	7.975	.002 †
Quotient Score	86.22 (14.28)	92.44 (11.41)	99.78 (16.80)	16%	4.813	.015	13.498	.002		
T – units	5.50 (7.09)	9.33 (5.56)	2.44 (11.65)	92%	5.652	.035	19.057	.002		
Word Count	64.56 (92.29)	89.56 (88.09)	135.0 (124.70)	102%	8.038	.016	23.714	.001		
Character Count	269.44 (351.44)	378.5 (386.19)	5 44.11 (520.95)	109%	6.714	.024	23.644	.001		

Note. Test of Written Language = TOWL-3; Huynh-Feldt = †

yielded significant differences. The p values ranged from .020 to .000. Within subjects effects univariate tests were run on contextual language and composite scores, because these two scores approached significance on the MANOVA yet reached levels of statistically significant differences on the within-subjects contrast trend analysis. When a Huynh-Feldt test (which serves as a correction technique for violation of sphericity in this type of situation) was conducted, contextual language achieved a statistically significant difference with an increase of 22% in quality between the pretest (M = 7.72, SD = 2.56) and posttest (M = 9.44, SD = 2.89), F (1, 8) = 5.910, p = .007. The Huynh-Feldt test also yielded a statistically significant difference with an increase of 26% between the pretest (M = 23.67, SD = 6.74) and posttest (M = 29.89, SD = 7.86), F (1, 8) = 7.975, p = .002.

Handwritten Products

When examining the handwritten writing products of students who were not taught a specific writing strategy, a writing sample at the pretest and a writing sample at the posttest level were evaluated. There were some interesting percentage gains for the students on these samples (see Table 16). Contextual Convention, which represented the smallest gain on the three word processed samples actually exhibited the largest percentage gain, with a 31% increase between the pretest (M = 6.44, SD = 3.29) and the posttest (M = 8.39, SD 2.83), F (1, 8) = 7.175, p = .028. All other measures of handwriting performance showed much smaller changes in performance, with a range of 5% to a decrease of 8%, and none of them reached or even approached statistically significant differences.

Summary

When evaluating data analysis results to determine if there is a difference in the quality and quantity of the written performance of students who were not taught story

Table 16

Statistical Analysis Results for the Pretest and the Posttest Handwritten Writing Samples of the Comparison Group.

	Handwriting			MANOVA	
Measures	*Pretest*	*Posttest*			
	M (SD)	*M (SD)*	*Percent gains*	*F*	*p*
Quality of Spontaneous					
Writing TOWL-3					
Contextual Convention	6.44 (3.29)	8.39 (2.83)	31%	7.175	.028
Contextual Language	8.89 (3.63)	8.16 (3.04)	-8%	.377	.556
Story Construction	10.33 (2.88)	10.50 (3.11)	2%	.014	.908
Composite Score	25.67 (8.22)	27.06 (7.12)	5%	.454	.520
Quotient Score	90.67 (17.58)	93.72 (15.39)	3%	.278	.613
T – units	13.22 (7.83)	12.50 (8.94)	-5%	.023	.883
Word Count	103.33 (52.97)	106.78 (69.02)	3%	.158	.895
Character Count	429.22 (230.05)	421.11 (267.02)	2%	.019	.883

Note. Test of Written Language (3rd edition)= TOWL-3

Table 17

Mean Scores and Percent Gains for Handwritten and Word Processed Writing Samples Performed at the Pretest and the Posttest Intervals for the Comparison Group (n = 9).

	Handwritten			Word Processed		
Measures	*M (SD)*		*Percent gains*	*M (SD)*		*Percent gains*
*TOWL-3***						
Contextual Convention						
Pretest	6.44	(3.29)		8.22	(1.25)	
Posttest	8.39	(2.83)	31% *	8.78	(3.24)	7%
Contextual Language						
Pretest	8.89	(3.63)		7.72	(2.56)	
Posttest	8.16	(3.04)	-8%	9.44	(2.89)	22% *
Story Construction						
Pretest	10.33	(2.88)		7.61	(3.22)	
Posttest	10.50	(3.11)	2%	11.67	(2.57)	53%**
Composite Score						
Pretest	25.67	(8.22)		23.67	(6.74)	
Posttest	27.06	(7.12)	5%	29.89	(7.86)	26%*
Quotient Score						
Pretest	90.67	(17.58)		86.22	(14.28)	
Posttest	93.72	(15.39)	3%	99.78	(16.80)	16%**
T– units						
Pretest	13.22	(7.83)		5.50	(7.09)	
Posttest	12.50	(8.94)	-5%	12.44	(11.65)	126%**
Word Count						
Pretest	103.44	(52.97)		64.56	(92.29)	
Posttest	106.78	(69.02)	3%	135.0	(124.70)	109%**
Character Count						
Pretest	429.22	(230.05)		269.44	(351.44)	
Posttest	421.11	(267.02)	12%	544.1	(520.95)	102%**

*Note. Test of Written Language (3rd edition) = TOWL-3 Statistically significant p values of <.05 = *, < .01 = ***

webbing and to use visual thinking software, the results show there were a number of statistically significant differences when producing their work using the word processor. These differences were found in the writing performance of students regarding changes in the quality of their writing as well as the quantity of their writing. Therefore, students in

the comparison group showed evidence of significant increases in their writing quality as well as their quantity although they did not receive any strategy instruction. It should be remembered that this group had daily writing practice, but no story webbing or visual thinking software instruction. However, when analyzing the quality and quantity of student written products produced in handwriting the results were very different, because only one spontaneous subtest on the *TOWL-3* achieved a statistically significant difference.

Question 3

Research question three asked if there was a difference in the quality and quantity of the written language performance for students with mild disabilities when they were taught story webbing and to use visual thinking software, compared to students with mild disabilities who were not taught story webbing or to use visual thinking software. Repeated measures MANOVA were conducted to determine if there was a difference in the quality of the written products of students in the intervention group vs. the comparison group. Scores yielded from the spontaneous subtests, composite scores, and quotient scores from the *TOWL-3* were used in addition to the T-unit evaluation information was used for analysis. Also, information regarding differences in the amount written when comparing the two groups was gleaned from T-unit counts, word counts and character counts were analyzed.

Word Processed Writing Products

Effect of Time

Repeated measures MANOVA were conducted comparing the performance of the intervention group vs. the comparison group, using the word processed writing samples

produced at the pretest, mid test, and posttest intervals. When examining the time effect for both groups combined, all measures of evaluation with the exception of the contextual convention from the *TOWL-3*, yielded levels of statistically significant differences (see Tables 18 and 19). The subtest of contextual language for both groups combined yielded a statistically significant difference over time with an increase of 17% in the performance between the pretest (M = 7.67, SD = 2.21) and posttest (M =8.94, SD =2.26), F (1, 16) = 5.54, p = .010. Regarding story construction there was a 37% increase in the quality between the pretest (M =9.47, SD = 2.8) and posttest (M = 10.67, SD = 3.0) yielded a significant difference, F (1, 16) = 13.11, p = .000. On composite scores, there was an 18% increase in quality between pretest (M = 24.17, SD = 6.78) and posttest (M = 27.53, SD = 6.51), F (1, 16) = 4.77, p = .017, while quotient score showed an increase of 12% between the pretest (M = 87.39, SD = 14.47) and posttest (M = 94.72, SD = 14.06), F (1, 16) = 5.33, p = .012.

All three measures examining writing quantity were found to have statistically significant differences and exhibited percentage gains between 83% and 94%. T-units showed an increase of 94% between the pretest (M = 12.26, SD = 6.59) and the posttest (M = 11.19, SD = 6.94), F (1, 16) = 12.44, p = .000. Word count showed an increase of 89% between the pretest (M = 101.39, SD = 52.92) and the posttest (M = 97.11, SD = 55.05) yielded a significant difference, F (1, 16) = 14.16, p = .000. Character count showed an increase of 83% between the pretest (M = 410.94, SD = 216.51) and posttest (M = 383.33, SD = 210.43), F (1, 16) = 12.434, p = .000.

Table 18

Statistical Analysis Results for the Word Processed Writing Samples Performed at Pretest and Posttest Intervals for Both Groups.

Measures	MANOVA Repeated Measures				Between-Subjects Effects		Mean Scores Both Groups		
	Time		Time * Trt				Pretest	Posttest	Percent
	F	p	F	p	F	p	M (SD)	M (SD)	gains
Quality of Spontaneous Writing (TOWL-3)									
Contextual Convention	.06	.98	.18	.91	.56	.47	8.78 (1.55)	8.86 (2.39)	1%
Contextual Language	5.54	.010	.75	.54	.78	.39	7.67 (2.21)	8.94 (2.26)	17%
Story Construction	13.11	.000	2.66	.09	.30	.59	7.97 (2.94)	10.97 (2.38)	37%
Composite Score	4.77	.017	1.20	.35	.11	.74	24.47 (5.45)	28.81 (5.96)	18%
Quotient Score	5.33	.012	1.15	.37	.20	.66	87.22 (11.83)	97.39 (12.76)	12%
T – units	12.46	.000	1.74	.20	1.20	.18	4.75 (5.24)	9.22 (8.71)	94%
Word Count	14.16	.000	2.64	.09	2.23	.16	53.17 (66.95)	100.39 (93.81)	89%
Character Count	12.43	.000	1.97	.16	1.99	.18	222.72 (254.71)	408.67 (388.42)	83%

Note. Test of Written Language (3rd edition) = TOWL-3; Treatment = Trt

Table 19

Statistical Analysis Results for the Handwriting Writing Samples Performed at the Pretest and Posttest Intervals for Both Groups.

Measures	MANOVA Repeated Measures				Between-Subjects Effects		Mean Scores Both Groups		
	Time		Time * Trt				Pretest	Posttest	Percent
	F	p	F	p	F	p	M(SD)	M(SD)	gains
Quality of Spontaneous Writing (TOWL-3)									
Contextual Convention	10.268	.006	.038	.848	.386	.543	6.86 (2.79)	8.69 (2.60)	27%
Contextual Language	.237	.633	2.135	.163	.989	.335	7.81 (3.13)	8.17 (2.49)	5%
Story Construction	3.768	.070	2.790	.114	.319	.58	9.47 (2.80)	10.67 (3.00)	13%
Composite Score	5.719	.029	1.969	.180	.130	.723	24.17 (6.78)	27.53 (6.51)	14%
Quotient Score	5.872	.028	1.998	.177	.139	.714	87.39 (14.47)	94.72 (14.06)	8%
T – units	.543	.472	.057	.814	.610	.446	12.26 (6.59)	11.19 (6.94)	-9%
Word Count	.183	.675	.596	.451	.234	.635	101.39 (52.92)	97.11 (55.05)	-4%
Character Count	.602	.449	.300	.591	.339	.569	410.90 (216.5)	383.33 (210.43)	-7%

Note. Test of Written Language (3rd edition) = TOWL-3; Treatment = Trt

Effect of Time and Treatment

When statistical evaluations were conducted exploring the combination of time and treatment, only two measurements approached the level of significant difference (see Table 18). Those measurements were story construction, F (1, 16) = 2.66, p = .089, and word count, F (1, 16) = 2.64, p = .090. This suggests that the intervention group and the comparison group do not differ significantly across testing intervals. These results were supported when the between-subjects effects were conducted, with no areas yielding levels of statistical significance, indicating that there were no measures on which the intervention and the comparison groups differed substantially.

Handwritten Products

Effect of Time

Repeated measures MANOVA were conducted comparing the performance of the intervention group vs. the comparison group, using the handwritten writing samples produced at the pretest and posttest intervals. When examining the time effect for both groups combined (see Table 19) three areas yielded statistically significant differences on the spontaneous subtest. Contextual convention from the *TOWL-3*, yielded levels of statistically significant differences, with an increase of 27% between the pretest (M = 6.86, SD = .669) and posttest (M =8.69, SD =6.26), F (1, 16) = 10.268, p = .006. Composite scores from the *TOWL-3*, yielded levels of statistically significant differences, with an increase of 14% between the pretest (M = 24.17 SD = 6.78) and posttest (M =27.53, SD =6.51), F (1, 16) = 5.719, p = .029. Quotient scores from the *TOWL-3* yielded levels of statistically significant differences, with an increase of 8% between the pretest (M = 87.39, SD = 14.47) and posttest (M =94.72, SD =14.06), F (1, 16) = 5.872, p =

.028. None of the three measures examining writing quantity were found to have statistically significant differences between the pretest scores and the posttest scores.

Effect of Time and Treatment

When statistical evaluations were conducted exploring the combination of time and treatment, there were no measures found to have statistically significant differences (see Table 19). This suggests that the intervention group and the comparison group do not differ significantly across testing intervals when comparing their handwritten performance in regard to quality or quantity. These results were supported when the between-subjects effects were conducted, with no areas yielding levels of statistical significance, indicating that the intervention and the comparison groups do not differ differed substantially.

Percent Gains for Word Processed vs. Handwritten Products

Percent gains on the word processing writing samples were evaluated using the pretest and posttest means (see Table 20). Both groups showed overall gains in the quality of their writing products on all *TOWL-3* measures with the exception of contextual convention. The intervention group showed a decrease in contextual convention with a drop of 4% between pretest and posttest, while the comparison group showed a modest gain of 7% on this subtest. The intervention group showed gains between 8 and 24% on all other measures on the *TOWL-3*; however, the comparison group showed gains of 16 to 53%. Although both groups increased their performance between pretest and posttest, the gains exhibited by the comparison group were approximately twice those of the intervention group on all measures, as can be seen on Table 20. On T-units, the largest difference between groups was found when the

intervention group showed a gain of 50%, while the comparison group showed a gain of 126%. Both groups had significant gains in the other measures of quantity of writing products.

Table 21 displays the percent gains comparing the mean scores of the handwritten vs. word processed writing samples at the pretest and the posttest intervals. Examining quantity of writing, handwriting performance between pretest and posttest actually dropped, with the exception of word count with the comparison groups which showed a very modest 3% increase. When comparing the handwriting samples of students in the comparison group with their performance on word processed samples (see Table 22) their increase in writing quantity was between 102% and 126%. The only measure where the group showed more than a 5% increase on their handwriting was with contextual convention which represented their lowest increase while word processing. The amount of writing by students in the intervention group actually dropped by a larger percentage than the comparison group, the intervention group exhibited more improvement in the quality of their handwritten products.

Summary

The comparisons were made in regard to the written performance of both groups, which suggested that when both groups were considered together there was consistent improvement between the pretest and the posttest which was similar for both groups. However, when examining the mean scores and determining the percent gains, the comparison group clearly made larger gains between the pretest and the posttest performance on the word processed samples (see Table 21). The increases in writing quality and writing quality by the comparison group were approximately twice

Table 20

Mean Scores and Percentage Gains for the Word Processed Writing Samples at the Pretest, Mid Test and Posttest Intervals.

Measures	Intervention group (n = 9)			Comparison Group (n = 9)			Both groups (n = 18)		
	M	*(SD)*	*% gain*	*M*	*(SD)*	*% gain*	*M*	*(SD)*	*% gain*
TOWL-3									
Contextual Convention									
Pretest	9.33	(1.68)		8.22	(1.25)		8.78	(1.55)	
Posttest	8.94	(1.26)	- 4%	8.78	(3.24)	7%	8.86	(2.39)	1%
Contextual Language									
Pretest	7.61	(1.95)		7.72	(2.56)		7.67	(2.21)	
Posttest	8.44	(1.38)	11%	9.44	(2.89)	22%	8.94	(2.26	17%
Story Construction									
Pretest	8.33	(2.78)		7.61	(3.22)		7.97	(2.94)	
Posttest	10.28	(2.08)	24%	11.67	(2.57)	53%	10.97	(2.38)	37%
Composite Score									
Pretest	25.28	(4.03)		23.67	(6.74)		24.47	(5.45)	
Posttest	27.72	(3.33)	10%	29.89	(7.86)	26%	28.81	(5.96)	18%
Quotient Score									
Pretest	88.22	(9.54)		86.22	(14.28)		87.22	(11.83)	
Posttest	95.00	(7.14)	8%	99.78	(16.80)	16%	97.39	(12.76)	12%
T – units									
Pretest	4.00	(2.61)		5.50	(7.09)		4.75	(5.24)	
Posttest	6.00	(1.50)	50%	12.44	(11.65)	126%	9.22	(8.71)	94%
Word Count									
Pretest	41.78	(26.77)		64.56	(92.29)		53.17	(66.95)	
Posttest	65.78	(21.33)	57%	135.00	(124.70)	109%	100.39	(93.81)	89%
Character Count									
Pretest	176.00	(97.14)		269.44	(351.44)		222.72	(254.71)	
Posttest	273.22	(89.08)	55%	544.11	(520.95)	102%	408.67	(388.42)	83%

Note. Test of Written Language (3rd edition) = TOWL-3

Table 21

Pretest and Posttest Mean Scores and Percentage Gains of Handwritten Writing Samples.

	Intervention group (n = 9)			Comparison Group (n = 9)			Both groups (n = 18)		
Measures	*M*	*(SD)*	*percent gain*	*M*	*(SD)*	*percent gain*	*M*	*(SD)*	*percent gain*
TOWL-3									
Contextual Convention									
Pretest	7.28	(2.29)		6.44	3.29)		6.86	(2.79)	
Posttest	9.00	(2.47)	23%	8.39	(2.83)	31%	8.69	(2.60)	27%
Contextual Language									
Pretest	6.72	(2.22)		8.89	(3.63)		7.81	(3.13)	
Posttest	8.17	(1.97)	22%	8.16	(3.04)	-8%	8.17	(2.49)	5%
Story Construction									
Pretest	8.61	2.58)		10.33	(2.88)		9.47	(2.80)	
Posttest	10.83	(3.06)	26%	10.50	(3.11)	2%	10.67	(3.00)	13%
Composite Score									
Pretest	22.67	(4.99)		25.67	(8.22)		24.17	(6.78)	
Posttest	28.00	(6.23)	23%	27.06	(7.12)	5%	27.53	(6.51)	14%
Quotient Score									
Pretest	84.11	(10.56)		90.67	(17.58)		87.39	(14.47)	
Posttest	95.72	(13.45)	14%	93.72	(15.39)	3%	94.72	(14.06)	8%
T – units									
Pretest	11.31	(5.39)		13.22	(7.83)		12.26	(6.59)	
Posttest	9.89	(4.34)	- 12%	12.50	(8.94)	-5%	11.19	(6.94)	-9%
Word Count									
Pretest	99.44	(55.99)		103.33	(52.97)		101.39	(52.92)	
Posttest	87.44	(38.31)	- 12%	106.78	(69.02)	3%	97.11	(55.05)	-4%
Character Count									
Pretest	392.67	(214.34)		429.22	(230.05)		410.94	(216.51)	
Posttest	345.56	(139.96)	- 12%	421.11	(267.02)	2%	383.33	(210.43)	-7%

Note. Test of Written Language (3rd edition) = TOWL-3

Table 22

Percent Gains for Handwritten vs. Word Processed Writing Samples Performed at the Pretest and Posttest Intervals.

Measures	Handwritten Products			Word Processed Products		
	Intrv (n=9)	Comp (n=9)	Both (n=18)	Intrv (n=9)	Comp (n=9)	Both (n=18)
TOWL-3						
C C	23%	31%	26%	-4%	7%	1%
C L	22%	-8%	5%	11%	22%	17%
S C	26%	2%	13%	24%	53%	37%
C S	23%	5%	14%	10%	26%	18%
QS	14%	3%	8%	8%	16%	12%
T – units	-12%	-5%	-9%	50%	126%	94%
Word Ct	-12%	3%	-4%	57%	109%	89%
Char Ct	-12%	-2%	-7%	55%	102%	83%

Note. Test of Written Language (3rd edition)= TOWL-3; Contextual Convention=CC; Contextual Language=CL; Story Construction=SC; Composite Score=CS; Quotient Score=QS; Word Count=Word Ct; Character Count = Chr Ct; Intervention = Intrv; Comparison = Comp

the amount of the intervention group. However, on the handwritten products that is not the case as the intervention group actually increased in writing quality by a larger percent. The information presented in Table 22 illustrates that the intervention group showed more consistent gains in the students writing quality between their handwriting and their word processed products, while the comparison group showed very high gains on the word processed products and very low gains on their handwritten products.

Question 4

Research question four asked if students' self-perceptions regarding written language tasks changed when using story webbing and visual thinking software. To

answer this question, the results of the Student Attitudes Survey (SAS) Appendix B, and the Student Interview Questionnaire (SIQ) Appendix C, at the pretest and the posttest levels for students in the intervention group who had been taught story webbing and to use the visual software program Inspiration were examined. The descriptive data was analyzed by conducting MANOVA with the responses from the Student Attitudes Survey (SAS) Appendix B, while student responses to the Student Interview Questionnaire (SIQ) Appendix C, yielded descriptive information regarding question four.

Student Attitudes Regarding Written Language

The 12 questions on the SAS can be grouped into three dimensions. Questions 1, 4, 8, and 11 concerned student attitudes regarding writing, questions 3, 6, and 9 concentrated on computer usage, and questions 2, 5, 7, 10, and 12 explored knowledge of writing strategies. Using a 6-point Likert-type scale (6 = strongly agree, and 1 = strongly disagree), students were asked to respond to questions. Question number 2 and 8 were reverse scored because they were negatively stated. All students in the intervention group participated in a pre and a posttest SAS.

Comparisons were made of student's responses at the pretest level to the posttest level regarding the dimensions of attitudes about writing, computer usage, and strategy usage (see Table 23). There were statistically significant differences found in regard to attitudes about writing and strategy usage. Changes concerning the dimension of attitudes, with an increase of 8% between pretest ($M = 3.61$, $SD = .92$) and posttest ($M = 3.89$, $SD = 1.13$), with $F(1, 8) = 5.321$, $p = .035$, implies that attitude about writing changed from the pretest to the posttest level substantially. There was a high percentage

gain of 14% (M = 3.78, SD = 1.30) and posttest of (M = 4.33, SD = 1.22) on the question which said, "I enjoy writing."

Within the dimension of computer usage there was an overall increase in positive responses of 11% between pretest (M = 2.93, SD = 1.15) and posttest (M = 3.22, SD = 1.55), F (1, 8) = 1.219, p = .286. On the item, "I know how to write a story using a computer," there was a 23% increase in positive reaction in student response from the pretest to (M = 1.78, SD =.67) the posttest (M = 2.33, SD = 1.41).

Following the same pattern, then examining the questions involving writing strategies, there was a significant difference over time, with an increase of 8% between the pretest (M = 2.58, SD. 55) and the posttest (M = 2.87, SD = 1.09), F (1, 8) = 5.636, p = .030. When responding to the item "It helps me to picture in my mind what I want to write," there was an increase of 24% in positive responses between the pretest and the posttest M = 2.33, SD.87) and the posttest (M = 2.89, SD = 1.76). This suggests that responses about writing strategies changed substantially at the posttest level.

When examining percent gains all three dimensions on the SAS showed improvement using mean scores from the pretest to the posttest as illustrated in Table 23 and Figure 2. Percent gains were similar in results across all areas with all gains falling between 8% and 11% and all changes representing an increase in positive responses.

Results of Student Interviews

The descriptive information used to address question 4 was derived from the intervention groups. The questions on the Student Interview Questionnaire (SIQ) fell within the three dimensions, student attitudes about writing; computer knowledge, and use of writing strategies. Content analysis was used to examine responses on each

Table 23

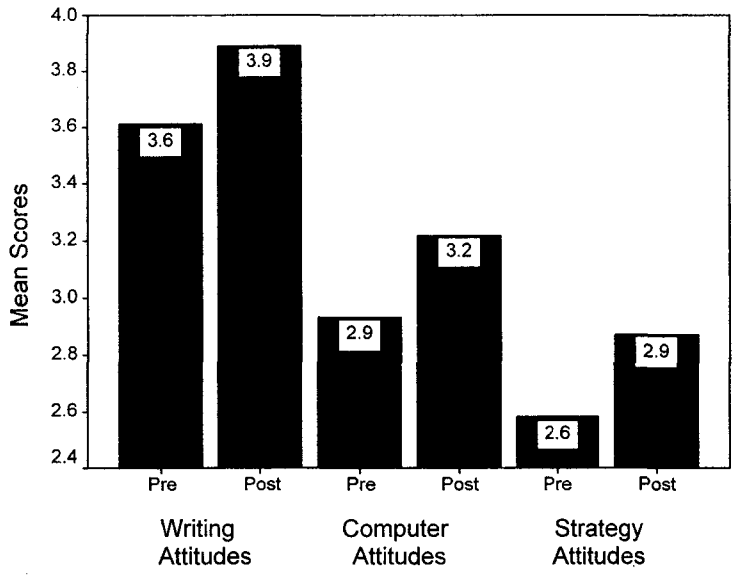
Mean Scores, Percent Gains, and Results of Statistical Analysis for the Intervention Group (n = 9) on the SAS at Pretest and Posttest Intervals.

			MANOVA		
SAS Dimensions	Pretest M (SD)	Posttest M (SD)	Percent gains	*F*	*p*
Attitudes					
1.) I enjoy writing.	3.78 (1.30)	4.33 (1.22)	14%		
4.) I am a good writer.	3.89 (1.61)	4.11 (1.54)	6%		
8.) It does not matter how I write, as long as I finish the job.*	3.11 (1.62)	2.89 (1.36)	-7% *		
11.) When I work on writing assignments, I feel comfortable with my writing.	2.89 (1.17)	3.00 (1.66)	4%		
Attitudes Total	3.61 (.92)	3.89 (1.13)	8%	5.321	.035
Computer					
3.) I know how to write a story using a computer.	1.78 (.67)	2.33 (1.41)	23%		
6.) I have good typing/keyboarding skills.	3.00 (1.73)	3.22 (1.72)	7%		
9.) It is easier to write a story when I use a computer than when I use paper and pencil.	2.67 (2.06)	3.22 (1.86)	17%		
Computer Total	2.93 (1.15)	3.22 (1.55)	11%	1.219	.286
Strategies					
2.) I think that using a writing strategy is not very important. *	2.56 (1.33)	2.67 (1.41)	- 4% *		
5.) I plan what to write before I start.	2.56 (1.13)	3.00 (1.58)	17%		
7.) It helps me to picture in my mind what I want to write.	2.33 (.87)	2.89 (1.76)	24%		
10.) It helps me to organize my ideas before I write.	2.78 (1.39)	2.78 (1.39)	0%		
12.) Using a strategy helps me write better.	2.67 (.50)	3.00 (1.66)	12%		
Strategies Total	2.58 (.55)	2.87 (1.09)	11%	5.636	.030
SAS TOTAL	37.22 (8.48)	40.00 (11.67)	8%	3.035	.101

Note. * = reversed scoring; *SAS* = Student Attitudes Survey

Figure 2

Student Attitudes Survey Pretest and Posttest Mean Scores.



question of the interview. Statements made by the students were coded, matched with similar statements, and then grouped accordingly. In addition, a pretest and posttest frequency count of all similar statements was made and then comparisons were made between pre and posttest statements for the entire group and for each student. Some students gave more than one response to some questions.

Attitudes About Writing

When examining student attitudes about writing, students were asked: What do you think of yourself as a writer? Student responses could be grouped into 6 primary domains: terrible/very bad, bad, not very good, middle/OK, good and other (see Table 24). At the pretest interval there was one student who described himself as "terrible" or "very bad" and he maintained that same self-description at the posttest. One student described himself as a "bad writer" at the pretest and three at the posttest. Two students

rated themselves as "not very good writers at pretest and at posttest." "Middle" to "OK" was the description used by two students at the pretest and one at the posttest interval. Two students were consistent and described themselves as "good" or "cool" at the pretest and at the posttest levels. And one student answered the question at pretest by saying "I'll never be a writer....I'm a very poor writer." And at posttest the same student said, "I could never be a writer, I just can't." Also, one student summarized his skills as a writer at the pretest level by saying simply, "I suck," however, by the posttest interview he had changed his description to "not very good."

When students were asked, what do other people think about your writing, two students at the pretest level professed that they had no idea what other people thought of their writing. However, one of those students changed her answer to, "They think I am a good writer." Three students said that people think they are a "good writer" at the pretest, and those three responded in the same way at posttest along with one student who had originally said that people think he is an "OK" writer. Several students gave more comprehensive responses during their posttest interviews. One student who had declined to elaborate on her response that people think she is "OK" at the pretest explained during posttest that, "My sister thinks it is a little bad. My older sister says I need to make it more exciting." Another student had simply said "bad" at the pretest and was not willing to add to that response during pretest, but during the posttest interview he said, "The teachers say it is not good, they don't say why."

When students were asked, what is more important when you are writing, getting finished or doing a good job, five during pretest and three during posttest responded that doing a good job was most important. Many followed that response with an explanation.

Table 24

Comparison of Pretest and Posttest Descriptive Attitudes Regarding Writing Process.

Student Descriptions	Pretest Total (n=9)	Posttest Total (n=9)	Pretest Student #	Posttest Student #
2) What do you think of yourself as a writer?				
Terrible / very bad	1	1	1	1
Bad	1	3	8	4, 5, 8
I "suck"	1		4	
Not very good	2	2	6, 9	6, 9
Middle / OK	2	1	5, 7	7
Good / cool	2	2	2, 3	2, 3
3) What do other people think about your writing?				
Bad / don't like it	1		7	
Messy / sloppy	2	2	9, 4	7, 9
Not very good		2		4, 3
OK	1		5	
Good	3	4	1, 2, 6	1, 2, 5, 6
Don't know / no idea	2	1	3,8	8
4) What is more important when you are writing, getting finished or doing a good job?				
Good job	5	3	1, 4 5, 6, 7	1, 6, 7
Getting finished	2	4	8, 9	4, 5, 8, 9
Both	2	2	2, 3	2, 3
11) If you could choose between taking a multiple choice test and writing a paper about a topic, which would you choose?				
Multiple-choice. (Why?)	7	7	1,2,3,4,5,8,9	2,3,4,5,7,8,9
(Don't want or like to write)	(2)	(3)	2,8	2,3,9
(Easier /choose answer)	(4)	(3)	1,4,5,6,	1,5,6,7,8,
(Testing strategy information)		(1)		4
(Don't know)	(1)		9	
Writing. Why?	2	2	7,6,	1,6
(Easier /choose answer)	(1)	(2)	7	1,6
(Testing strategy information)	(1)		6	
12) If there was one thing you could change about your writing, what would it be? *				
Better punctuation / spelling	2		1,6	
Better handwriting	3	4	2,7,8	1,4,7,8
Looks/neater/less sloppy	3	5	4,5,7	1,4,5,7,8
Nothing		2		5,9
Use a computer	1		9	
I don't know	2		5	
Better ideas and structure		2		2,6
Better quality		1		2

Note. * = Some students gave more than one response.

Table 25 lists some of the reasons students gave for their choices. Two of the students changed their responses from "doing a good job" on the pretest, to "getting finished" on the posttest. The two students who reported that both were important maintained the same response.

Table 25

Reasons Students Gave When Comparing the Importance of Getting Finished or Doing a Good Job When Writing

Reasons given for why it is more important to do a "good job" when writing:
▪ "If you hurry and get finished, you just have to go back and do it over again."
▪ "If you do a good job, you get a better grade."
▪ "If you speed through it you mess up."
Reasons given for why it is more important to get finished with your writing:
▪ "Getting finished, so you can do whatever you were doing before."
▪ "You get done quicker and there is less getting yelled at."
▪ "To get a better grade."
▪ "Because I don't want to get in trouble."

When students were asked, if you could choose between taking a multiple choice test or writing a paper about a topic, which would you choose, students primarily chose a multiple-choice test, with seven out of nine at the pretest and seven out of nine at the posttest. When asked for clarification regarding their responses, the reasons students gave for choosing a multiple choice test were consistent across pretest to posttest responses. Two students chose "don't want or like to write" at the pretest and three at the posttest, and four chose that "multiple choice is easier" or "you just choose the answer" as their reason on the pretest and three during the posttest. One student changed her answer on

the posttest to indicate a strategy rather than just that "multiple choice is easier than writing."

When students were asked, if there was one thing that you could change about your writing, what would it be, many of the answers focused on better handwriting with three at the pretest and four the posttest. And with "looks better, neater or less sloppy" there were three at pretest and five at posttest. The actual quality of written performance was not mentioned during pretest, however, there were two responses on the posttest which dealt with better ideas, structure and quality of writing. Conversely, at the posttest interval, two students actually said there was "nothing" that they would change about their writing; however, one of those students had given "don't know" as their pretest answer and the other had said they "would have started using a computer earlier" as the pretest response to this question. The changes in pretest to posttest response for many students were fairly minor, such as from spelling to punctuation. However two of the students changed from concerns about the appearance of their writing to the quality of their writing. One student's response at pretest was, "I wish I was like when I was a youngster. I had better handwriting when I was little." His posttest response was, "I would change it back to the way it used to be. When I was little I used to get A's in handwriting. But now I'm having lots of trouble with spelling. If I want to use a big word and don't know how to spell it, I have to change words."

There were some positive overall changes in student responses between pretest and posttest concerning student attitude about writing. Students were more willing to elaborate on answers than during the posttest. The fact that they actual quality of writing was mentioned at the posttest level by two students represented a positive movement.

Also, one other student mentioned strategies at the posttest when asked about their choice of multiple choice tests.

Computer Usage

When students were asked, is there any difference in your writing when you use a computer, six of the students reported a difference at the time of the pretest, and seven reported a difference at the posttest (see Table 26). Of the six who reported at the pretest that they felt there was a difference in their writing when they used a computer, two of them felt the computer was easier while four reported that handwriting was easier. Of the seven that reported there was a difference at the posttest level, five felt the computer was easier and two reported that handwriting is easier. Three students reported no difference at pretest and two students reported no difference at the posttest level. One student whose pretest response was "no difference" changed his responses at the posttest to indicate that the computer was easier to use when writing. One student who was sure in his response at the pretest of "there is a big difference, I can't type. I don't know how to write with a computer" changed his response at the posttest to, "Yes, I feel more comfortable with paper and pencil. But recently, using a laptop I am starting to like it better. It helps me find my mistakes." Two of the nine students specifically mentioned tools such as spell and grammar check as a reason they felt that writing on the computer was helpful. Two of the students who originally said that handwriting was easier changed their answers to the time of the posttest interview to indicate that computers were easier to use.

Several students reported that handwriting was easier because of their lack of computer skills. Also, three of the students reported that they thought handwriting was harder because they reported that handwriting made their hands hurt, and two students

Table 26

Comparison of Pretest and Posttest Descriptive Attitudes Regarding Computer Usage.

Student Descriptions	Pretest Total (n=9)	Posttest Total (n=9)	Pretest Student #	Posttest Student #
7.) Is there any difference in your writing when you use a computer?				
No	3	2	3,5,6	3,6
Yes	6	7	1,2,4,7,8,9	1,2,4,5,7,8,9
(Computer easier)	(3)	(6)	1,4,6	1,4,5,6,8,9
(Handwriting easier)	(6)	(3)	2,3,5,7,8,9,	2,3,7
8.) Do you find it easier, harder, or the same when you handwrite your work compared to using a computer?				
Easier to handwrite	5	4	2,3,4,5,9	2,3,5,9
Harder to handwrite	3	4	1,6,8,	1,4,7,8
Same to handwrite	1	1	7	6
10.) If you could choose between writing by hand, or on a computer which would you choose?				
Handwriting. (Why?)	4	3	3,4,5,7	2,5,7
(Lack of computer skills)	(4)	(1)	3,4,5,7	2
(Easier)		(1)		3
(Faster)		(1)		1
Computer. (Why?)	4	5	1,2,8,9	1,3,4,8,9
(Easier)	(3)	(2)	1,6,8	1,7
(Faster)		(1)		8
(Tools such as spell check)		(2)		9,4
(Depends on what you write	(1)		2	
Both/same. (Why?)	1	1	6	6
(Easier)	(1)	(1)	9	3

said it was because they had to go back and erase so much when handwriting. One student said that it was "about the same," but that she "liked the computer better." In addition, one student reported that handwriting was easier because "it's just that I type slow, and my thoughts don't get down that good, because I am thinking faster than I can get it down." Lastly, one student said it was "kind of the same" at pretest and at the posttest the same student said that "It is harder to write with paper and pencil because it takes me longer to write it out, especially since I am typing faster now."

When students were asked at the pretest level, do you find it easier, harder, or the same when you handwrite your work compared to using a computer, the choices were similarly divided with five students stating it is easier to handwrite compared to using the computer, three said it was harder to handwrite their work, and one said it is about the same to handwrite compared to using a computer to write. However, at the posttest only three students thought it was easier to write by hand, and five students thought it was harder to write by hand compared to using the computer to write. One student who reported it to be easier to write by hand changed his opinion to reflect he felt it easier to write with a computer.

When students were asked at the pretest level, if you could choose between writing by hand, or on a computer, which would you choose, and why, four students reported that they would choose to write by hand, four would choose the computer and one student felt he was about the same. At the posttest level, three students reported to prefer to write by hand, while five students would prefer computer and one student felt they were equal. When students were asked why they made those choices, the responses fell under one of five areas with four at the pretest and only one at the posttest intervals explaining that they lacked computer skills. The tools available on the computer, such as spell check accounted for two at the posttest. Three students listed that computers were easier at the pretest and one at the posttest. One student reported at the pre and the posttest levels that their preferred method depends on what they need to write. Only one student reported they would make a better grade as the reason for their choice. Lastly, one student chose handwriting at both occasions; however, at the posttest, he said

"Handwriting is still easier. But lately, I am starting to see the benefits of using a computer, especially with my poor spelling skills."

Again, modest improvements in attitudes were reported by students from the intervention group between their pretest interview and their posttest interview. Their responses regarding computers appeared to reflect their increasing knowledge about the features and tools available to the writer. Comments concerning features such as spell checks and grammar checks, that a written product looks neater when completed on the computer, and increasing confidence in using a computer to write were all discussed by the students at the posttest level. From student responses, it is clear that students are developing a sense of the computer as a tool.

Writing Strategies

When students were asked at the pretest, how do you plan what you will write, five of the nine students reported that they think about what to write before they start to write, and those same five students had the same response at the posttest level (see Table 27). Only one student reported using a specific strategy to plan at the pretest level and three students reported specific strategies at the posttest level, with the strategy used being listed as story webbing. Additionally, two students reported using other strategies, one student said that she "pictures a story in my mind," and another said he just "jots down ideas." However, three students at the pretest level and three students at the posttest level reported that they use no prewriting planning at all, saying they "just start writing, and/or they just think it up as I go along."

When students were asked, do you find it helpful to proofread your own work, five of the students at the pretest and at the posttest said that they find it helpful to

Table 27

Comparison of Pretest and Posttest Descriptive Attitudes Regarding Writing Strategies.

Student Descriptions	Pretest Total (n=9)	Posttest Total (n=9)	Pretest Student #	Posttest Student #
1.) How do you plan what you will write? *				
Just start writing	2	1	5,8	8
Think it up as go along	1		3	3,5
Think about what to write before I start	5	5	1,2,6,7,9	1,2,6,7,9
Story Webbing	1	3	4	4,6,7
Picture a story in my mind		1		6
Jot down ideas		1		7
5.) Do you find it helpful to proofread your own work?				
Yes	5	5	1,3,4,6,7	1,2,5,6,7
No	1	1	9	9
Sometimes	2	2	2,8	4,8
Don't proofread	1	1	5	4
6.) What sort of mistakes do you look for when you proofread your work? *				
Punctuation	8	8	2,3,4,5,6,7,8,9	1,2,3,4,5,6,7,8
Spelling	4	4	3,7,8,9	1,3,7,8
Structure	2		1,7	
Nothing		1		9
9.) When you start to write and you are struggling, what do you do? *				
Sit and think	5	3	1,4,6,8,9	1,2,9
Ask someone for help	2	2	1,5	1,5
Take a break	2	2	7,8	7,8
Make a web	1	3	4	4,6
Say I can't do it	1	1	2	2
Don't know	1	1	3	3
Throw the pencil or break it	1		9	
Get frustrated	1			8

Note. * = Some students gave more than one response.

proofread their work. This number represents approximately 55% of the total number. One of the students responded, "No, because I wouldn't know if I made a mistake or not" at the pretest and a very similar response at the time of the posttest. One student said,

"Yes, sometimes I forget but it does help." Two students said, "Yes, because it helps find mistakes." Another student said, "Yes, but I don't catch as many mistakes as if someone else proofreads it." Interestingly, one student offered the following explanation for why he did not proofread, "I don't really need to. I get yelled at even when I do it right."

When students were asked, what sort of mistakes do you look for when you proofread your work, the overwhelming majority to students, eight at the pretest and at the posttest, reported that they look for punctuation when they proofread. Additionally, four at the pretest and at the posttest reported checking for spelling errors. Only two at the pretest mentioned any type of check for writing structure. Students offered little explanation, they simply stated that they looked for "Spelling, punctuation, capitalization, and just make sure it sounds right." One student did explain that "I just write a big story then I have to break it down with my periods."

When students were asked at the pretest level, when you start to write and you are struggling, what do you do, five students at the pretest explained that they "sit and think," while that number dropped to three students at the posttest level. Two students at the pretest and two students at the posttest level reported that they "ask someone for help." Two students expressed anger or frustration at the pretest with one saying he would "throw the pencil or maybe break it," while the other said that he would "get frustrated." Both students had a more specific plan for the posttest, one chose to "ask for help" and the other said he would "take a break and then start over." In addition, the student who said they would "say I can't do it, I can't write an essay, but I can write sentences." changed his response to "I tell the teacher I don't have anything or I just sit there and think." Of the two students who mentioned using the story webbing at the time of the

posttest, one also said they would make a web at the time of the pretest. He said "I put down my pencil and think of something to help me, like a web" at the pretest, and "I think about past stories, and try to tie that stuff in. Like, the writings we did first week, I try to remember that and use some of that the next week to make a web."

Again, students were more willing to elaborate on their responses during the posttest, therefore giving more specifics regarding how they write. Some changes in student responses indicated that they used or at least were willing or able to discuss strategy usage more at the time of the posttest. From the responses gathered, it appears that there was a change in their attitudes regarding writing strategies. Strategies were certainly included more in their posttest interview responses.

Summary

Considering the changes demonstrated on the SAS and the percentage gains gleaned from those analyses, along with student comments on the SIQ, there were increases in student perceptions on all three dimensions. First, in regard to attitude about writing, there was an overall increase of 8%, however there was a 14% increase from pretest to posttest regarding the statement "I enjoy writing." Additionally, student comments on the SIQ were more positive, and students gave more details regarding their feelings.

Student responses on the SAS showed larger percentage gains on the dimension of computer usage, with an overall increase of 11% and a 23% increase in positive responses between pretest and posttest intervals when given the statement, "I know how to write a story using a computer." Also, when given the statement "It is easier to write a story when I use a computer than when I use paper and pencil," there was a 17% increase

in positive responses. To support those findings, students gave more positive responses on the SIQ.

When considering the students' self perceptions regarding writing strategy, between the pretest and the posttest there was an overall increase of 8% in positive responses. However, there was an increase of 17% when asked to respond to, "I plan what to write before I start," and a 24% increase in responses when reacting to "it helps me to picture in my mind what I want to write." These gains, in conjunction with student responses on the SIQ such as mentioning writing strategies and responses involving planning, demonstrate a more positive perception regarding writing strategies when students are taught story webbing and to use visual thinking software.

Question 5

Research question five asked if changes in behavior or writing performance were observed by instructors when students were taught story webbing and to use visual thinking software. Information was reported descriptively evaluating the entry information collected from the Instructor's Observation Logs regarding changes in the intervention group.

Instructor's Observation Logs were maintained throughout the study. Every day entries were made in the teacher's log by all three instructors. Content analysis was used to examine the entries from the Instructor's Observation Logs. Statements were coded, matched with similar statements, and then assigned to the appropriate theme. The three dimensions that were reported in the SAS and the SIQ were also used to examine instructor's perceptions of student behavior and written performance. These dimensions included: student attitude regarding the writing process, student attitude regarding

computer usage, and student attitude regarding writing strategies. Occasionally, an entry fell under more than one dimension.

Observations of Students' Attitudes about Writing

Regarding the dimension of change in student attitudes about writing, instructor entries in the Instructor's Observation Logs became more positive and entries regarding student opposition to writing decreased as the study progressed. During the first week of the study all entries, except one, reflected instructors' concerns and observations of students' comments and behaviors reflecting negative attitudes about writing. Representative entries are presented in Table 28.

According to instructor observations, as the weeks progressed there were fewer negative comments and resistance by the students. The tone of the entries became more and more positive as the study progressed. However, instructors observed that there was a feeling of "being overwhelmed" on the part of the intervention group. Instructors observed that students and instructors were working at a much faster pace, compared to the comparison group, in an effort to complete all assignments involving story webbing and Inspiration software.

Observations of Students' Computer Usage

Regarding the dimension of student attitudes about computers, instructor entries in the Instructor's Observation Logs became more positive as the study progressed (see Table 29). Initially, the majority of the students reported that they had some computer keyboarding skills; however, based on student performance, it became apparent that for most of the students, those skills were extremely limited. Most students used a one finger, one hand, and a "hunt and peck" approach. Despite their very limited keyboarding skills,

Table 28

Representative Entries in the Instructors' Observation Logs Regarding Student(s) Attitudes About Writing

Week 1:

- [Student 9] Openly defiant about the writing task [A]
- [Student 9] Complained bitterly when he had to engage in today's writing task. [B]
- [Student 7] Said that she "is not very smart when it comes to writing." [C]
- [Student 3] Frustrated easily today during the writing assignment. [C]
- [Student 6] Really appeared to enjoy assignment today and told me about her story. [A]

Week 2:

- [Student 3] Always expresses discontent with his writing abilities. [A]
- [Student 9] Argumentative about writing tasks, unless he gets to use the computer to write. [A]
- [Student 4] Is actually getting more writing done: however, he continues to make negative statements about his writing such as, "I don't know how you will ever be able to read this; it doesn't make any sense, even to me." [B]
- [Student 4] Very distracted during his writing. [B]
- [Student 9] Doesn't argue nearly as much, the computer appears to be a huge incentive to get him to do anything. He learned how to change the fonts today and has been working on this writing assignment for over 45 minutes. [C]
- The intervention group as a whole appear a little overwhelmed by the amount of time it is taking to plan with Inspiration and then to write their story. They say they would rather spend their time on just learning the Inspiration software. They're moving very fast. [A]

Week 3:

- [Student 8] Writing well, appears to be very comfortable. [C]
- [Student 2] Facial expression is that of frustration, Twenty minutes and only one sentence written.[B]
- [Student 9] Making lots of noise with his pencil and looking around and grinning at the students who appear irritated with him. [A]
- [Student 7] Once started, she is actively engaged in writing[A]
- Students do not argue about or oppose their daily writing assignments as much any more, in fact they often prepare for them without instructor input. [C]
- Everything is going much smoother, we're hearing less "I can't" and "I hate." [B] [C]

Week 4:

- [Student 5] Still doesn't like to write, but appears much more comfortable. [A]
- [Student 1] Focused the entire time during his post-posttest. That is really an improvement. He asked to put on the headphones without music to help block out the sound. Apparently it works for him. [A]
- [Student 9] Made everyone "shut-up" so that one of the instructors could read his story to the entire group. [C]
- All of the students are definitely writing longer products. [A]
- There is less resistance on the part of the entire group. [C]

Note. [A] = Instructor A; [B] = Instructor B; [C] = Instructor C

Table 29

Representative Entries in the Instructors' Observation Logs Regarding Student(s) Attitudes About Computer Usage

Week 1:

- [Student 9] When told that he was expected to write daily, he asked if he would be able to use the computers every day. He agreed to write daily if he got to use the computers. [A]
- [Student 9] Openly defiant: however, changed when promised later computer usage. [A]
- [Student 8] Very apprehensive about computer usage, says he doesn't know how. [C]
- [Student 1] A lot of difficulty with typing. He was very focused. [C]
- [Student 3] Distracted by the tools, did not like the squiggly lines. [C]
- The majority of the students do not have good typing skills, even those who are knowledgeable about computers. Only three students, say that they have actually produced their writing on the word processor before. Most students have typed from a written paper onto the word processor, but it appears not often enough to be skilled. [B]

Week 2:

- [Student 9] Doesn't argue nearly as much, the computer appears to be a huge incentive to get him to do anything. Has been working on writing assignment for over 45 minutes. [C]
- [Student 4] He is writing, and then experimenting with the features of the word processor. This is the first time I have ever seen him focus on a task this long. [B]
- [Student 4] He says he knows how to use a computer, but he's hesitant to keyboard. [A]
- Most of the students seems to enjoy today's computer exercise[C]
- [Student 5] Was intrigued with creating a table on computer. Liked helping others. [A]
- [Student 6] Still very slow with keyboarding. [B]
- [Student 2] She said, "I can still write faster with the paper and pencil." [B]
- [Student 8] He really enjoyed making the graph. He said, "My teacher tried to show me how to make a graph, but I didn't understand before. It's a lot better on a computer." [A]

Week 3:

- [Student 9] It always works to use a computer for him. It's a tremendous motivator. It's the only thing that we have found to motivate him. [A]
- [Student 3] He types one-handed but that doesn't seem to be an obstacle. [A]
- The kids are showing us how to use the computers now. [B]
- [Student 5] Is so intrigued with the Inspiration software that he can't get his writing done, in fact that is a problem for all of them. They need more time to explore the software. [C]
- [Student] All of the students' keyboarding skills are noticeably better (faster and more willingly, they like the keyboarding program). [B]

Week 4:

- [Student 9] Relatively focused the entire time. Responded well to occasional teacher walk by and read. He writes on the computer, but still resist when using paper and pencil. [A]
- [Student 9] Will work on other assignments for computer usage. [A]
- [Student 8] Not hesitant to write today, and not hesitant to use a computer any longer. [B]
- [Student 4] Begin typing with two hands immediately. Slow pace. Hunt and peck. [C]
- All students have improved their keyboarding. I did not realize how much until they did their typing posttest today. They typed a lot more in the same time frame. [B]

Having the students enter the classroom and set up their computers has become almost as natural as seeing them enter the classroom and get out a pencil. [A]

Note. [A] = Instructor A; [B] = Instructor B; [C] = Instructor C

all students with the exception of a couple of students were excited about using the computers everyday.

Representative entries are presented in Table 29. During the second week, entries in the Instructor's Observation Logs noted that although keyboarding skills were still slow, students were enjoying learning new features of the computer and were becoming more comfortable with computer usage. By the third week, students were "showing us how to use the computers now" [Instructor B] and their "keyboarding skills are noticeably better." During the fourth week, the students who initially were reluctant to use the computer were "not hesitant to use a computer any longer" [Instructor B]. One instructor's entry stated, "Having the students enter the classroom and set up their computers has become almost as natural as seeing them enter the classroom and get out a pencil" [Instructor A].

Observations of Students' Writing Strategies

Regarding the dimension of student attitudes about writing strategies, instructor entries in the Instructor's Observation Logs reflect a more positive tendency to use writing strategies, by most of the students, as the study progressed. Representative entries are presented in Table 30.

During the first week, prior to the intervention, the instructors observed that most students simply "began to write immediately" upon receiving their writing prompt. Only one student was observed to use any type of writing strategy other than sitting and thinking. By week two, a few of the students were excited about the Inspiration software and only one was reported to be enthusiastic about his writing, however many continued to show no outward sign of planning their writing. However, by the third week several of the students were observed making intricate planning webs on their computers but spending too little time writing from their web plan. By the fourth week, there was a split

Table 30

Representative Entries in the Instructors' Observation Logs Regarding Student(s) Attitudes About Writing Strategies.

Week 1:

- [Student 7] Jotted down a couple of ideas before she started to write. [C]
- [Student 6] Sat and appeared to think about what to write for a very long time. [C]
- [Student 1] Zero planning[B]
- Most of them immediately began to write with no planning time before. [B]
- They say they plan, but we do not see it. They start writing immediately. [A]
- It's almost like they are in a race to begin/finish and then they quickly get stuck. [A]

Week 2:

- [Student 2] Asked for extra paper. Used it to "help organize her thoughts," wanted to keep writing after the stopping time. She is the first one I have seen plan without being specifically told to. [A]
- [Student 8] Starting write immediately. Focused on writing prompt. [C]
- [Student 5] Is so excited about story webbing using the Inspiration software. [C]
- There's an enthusiasm in his writing we haven't seen before, as if the light bulb has gone off. [A]
- 0 or very little planning is still more common than not. Issue for entire group. [B]

Week 3:

- Many students are still spending very little time planning. [A]
- [Student 3] Intricate planning using the software[A]
- [Student 3] Is really into the story webbing and concentrating very well. [C]
- [Student 2] Struggled with the beginning, she asked if she had to story web. Once I told her she didn't have to web anymore, if she had done as much as she could, and she began to write her story. [A]
- [Student 7] Looked intently at the picture, and then drew pictures on the story web, did not use Inspiration. [A]
- [Student 7] Elaborate webbing on Inspiration, began using it for her writing. Inspiration probably took a little too much of her time. [B]
- [Student] Did not use webbing or any other apparent strategy. [C]

Week 4:

- [Student 9] Said "Planning is a waste of time." Very concerned with what other people are doing. [A]
- Several students sat and appeared to think for a couple of minutes then began writing. [B]
- [Student 1] Said that the "story webbing really helps me plan." [B]
- [Student 3] Immediately began writing, and then he stopped. He made a story web on Inspiration, and used that to write his story. When asked about that he said he "got stuck and that the story webbing had really helped" him. [A]
- [Student 4] When asked about his immediately starting to write his story, he said he had planned before he began; however, there is no evidence of planning. [C]
- [Student 1] says that he plans as he goes along. [C]

Note: [A] = Instructor A; [B] = Instructor B; [C] = Instructor C

with several students doing "Zero planning" [Instructor B], and several students actually used story webbing and/or Inspiration to help them plan. Students reported that "story webbing really helps me plan" [Instructor B].

Summary

Entries in the Instructor's Observation Logs clearly suggests that there are positive changes in students' attitudes about writing, computer usage and writing strategies according to the instructor's perceptions regarding students. All three dimensions have more positive teacher entries as the weeks progressed, less resistant behaviors by the students being observed. Also, instructors are observing an increased sense of comfort with the laptops. In addition, students have been observed speaking about planning and story webbing to plan writing. Instructors are documenting less resistance to engage in tasks, and there are entries which describe students voluntarily sharing their writing products with other students.

Inter-scorer Reliability

Prior to scoring writing samples, the exact text of the two writing samples which were handwritten at the pretest and the posttest intervals were entered into the word processor by an instructor. Entries were checked by a second instructor for accuracy; and 100% accuracy was achieved. This word processing entry allowed for word count and character count information to be quickly tabulated and recorded.

TOWL-3

Reliability refers to the ability of a measure to yield consistent results each time it is used (Monett, Sullivan, & DeJong, 1993), inter-scorer reliability refers to the ability of two or more evaluators to yield the same results. Three project instructors were trained to

score spontaneous writing products using the *TOWL-3* techniques. This training allowed the instructors to become familiar with the scoring procedure (Appendix N). The opportunity was provided for instructors to evaluate practice samples and then compare their results to each other. Both instructors scored all writing prompts. Due to the complexity of scoring, all writing samples were scored by two of the three instructors using the spontaneous subtest of the *TOWL-3*. The third instructor would score a writing sample when there was a notable difference of opinion between the two primary scorers, with compromise being reached after discussion. Additionally, the PRO-SCORE Computer Scoring System was used to interpret the *TOWL-3* results and yield standard scores and percentages. Using this method, the computer program allowed the instructors to quickly generate a report listing information necessary to analyze student performance. The *TOWL-3* yielded statistical information regarding the quality of student writing performance.

T-units

Two instructors were trained to evaluate T-units. Again, instructors were given the opportunity to conduct trial evaluations and compare their results. One instructor evaluated all samples and the second evaluator counted 33% of the T-units to provide inter-scorer information (Appendix O). In order to insure validity, inter-scorer reliabilities were conducted for each subtest and composite score of the *TOWL-3*, as well as 33% of the T-unit scores. The inter-scorer reliabilities were calculated using a two-way random effects model. Absolute criterion was selected because it is a more conservative measure of inter-scorer reliability, and the high correlation between the evaluators indicated the appropriateness of using absolute criterion (rater 1's rating are equal to rater 2's rating).

Additionally, the two instructors who scored all of the samples using the *TOWL-3* Protocol were trained to evaluate T-units. One instructor evaluated all writing samples and the second instructor evaluated 33% of the T-units to provide inter-scorer information. 33% of the samples were sufficient to establish inter-scorer reliability because the scores were extremely high with a rating of .9825 and .9929. The inter-scorer scores for all measure are presented in Table 31.

Table 31

Inter-scorer Reliabilities for Measures of Written Language

Writing Sample	Writing Method	Measurement	Inter-scorer Reliability
Pretest	Handwritten	Contextual Convention	.8972
		Contextual Language	.9216
		Story Construction	.9708
		Composite Score	.9825
		T-units	.9895
	Word Processed	Contextual Convention	.8965
		Contextual Language	.8446
		Story Construction	.9765
		Composite Score	.9853
		T-units	.9929
Mid	Word Processed	Contextual Convention	.8219
		Contextual Language	.9291
		Story Construction	.9360
		Composite Score	.9603
		T-units	-
Post	Handwritten	Contextual Convention	.8958
		Contextual Language	.9475
		Story Construction	.9652
		Composite Score	.9825
		T-units	-
	Word Processed	Contextual Convention	.9582
		Contextual Language	.9247
		Story Construction	.9511
		Composite Score	.9878
		T-units	-

Summary

Scores on all measures of the writing samples yielded inter-scorer reliabilities in the range of .8219 or higher, with only five of the 28 scores being below .9. Four of the five scores below .9 were on the subtest of Contextual Convention, with those scores being .8972, .8965, .8219, .8958, .9582 and .9731, respectively. The subtest of Contextual Language on the pre-test word processed sample yielded the only other score below .9, with .8446. In summary, the inter-scorer reliabilities are all considered high.

CHAPTER 5: DISCUSSION

Overview

It was anticipated that students who were taught story webbing as a writing strategy combined with daily technology usage would demonstrate improvement in the quality and quantity of their written products and have a more positive attitude toward writing, computers usage and strategy usage.

The research for this study includes the evaluation of writing samples for each student. This includes two handwritten samples and three word-processed samples. Quality of writing samples was evaluated using the spontaneous writing subtest of the *TOWL-3* and T-unit measurements. Quantity of the writing samples was analyzed using word count, character count, and T-unit counts. Changes in student perceptions were evaluated using information gleaned from the Student Attitudes Survey (SAS), and from student responses on the Student Interview Questionnaire (SIQ). Finally, information regarding instructor's perceptions of student performance and behavior was gathered from the Instructor's Observation Logs.

The findings of this study indicate that there are increases in the quality and the quantity of the writing performance when students with mild disabilities are taught story webbing as a writing strategy. However, the results also reveal that the same is true for students who practice writing everyday yet are not taught story webbing as a writing strategy. In this chapter, discussion will address the study's discoveries relevant to the effects of using story webbing and visual thinking software to improve the written language performance of students with mild disabilities. In addition to discussion of the

findings from this study, implications and limitations of the study are presented, and suggestions for future research are proposed.

Students Taught Story Webbing and Visual Thinking Software

Based on the results attributed to research question one, when students with mild disabilities are taught the writing strategy of story webbing and to use visual thinking software, there is an increase in the quality and quantity of their written language performance.

When the word-processed writing samples of students who were taught the writing strategy of story webbing and the visual thinking software Inspiration, are examined over time, there are not statistically significant differences found when examining the quality of their writing. However, there were improvements ranging from 8% to 24% (see Table 12) in the quality of writing between their pretest and their posttest, which means that within four weeks, students who are taught story webbing and to use Inspiration can improve their original writing quality performance by up to 25%. Considering that this is a population who experience enormous difficulty with writing tasks, any gain within four weeks is relevant; however, a 24% gain is indeed encouraging. For teachers of students with mild disabilities who struggle every day, the fact that the increases do not meet the criteria for statistical significance, likely holds little interest. The fact that these students are able to show gains in this brief period of time, likely holds great interest and hope.

When students are taught story webbing and to use visual thinking software, statistically significant increases in the quantity of their word processed products are shown (see Table 12). The increase in students' writing is between 50% and 57%, in their

T-unit count, word count, and character count. This illustrates that there is a statistically significant increase in the amount students write when they are taught to use story webbing and to use visual thinking software. Considering that there is a substantial increase in the amount students write under these conditions, it is worthwhile for any teacher who has students with mild disabilities in their classroom to teach them to use story webbing and Inspiration. Students with writing difficulties are very resistant to writing, and often engage in a variety of avoidance behaviors which are counterproductive and often exclude the student from writing practice, which the results from this study indicates is beneficial. Any increase in written expression should be considered relevant and worth pursuing.

The handwritten samples of students who were taught story webbing and to use visual thinking software display statistically significant differences, between the pretest and posttest performance, with all measures of writing quality on the *TOWL-3*, except on the subtest of story construction, and even that area approaches a statistically significant difference (see Table 13). This indicates that the writing quality is substantially better at the posttest level than at the pretest level for handwritten products. It is interesting to note that there is no statistically significant difference regarding the amount of writing. A possible explanation for the lack of increase is that the use of technology is a major focus of this study, with students writing everyday. This focus on technology usage might de-emphasize handwriting. Although students appeared to take the handwriting activity seriously, several students complained about not being allowed to use their word processors for this activity. Another interesting thought comes to the surface when it is realized that students in both groups started out producing more when handwriting. An

example of this is in the area of T-units; with word processing, the pretest mean for T-units is four and six at the posttest, while with handwriting the pretest mean is 11.31 and 9.89 at the posttest. Undoubtedly, students produced more when handwriting than when word processing; however the percentage gains between pretest and posttest with word processing is 50% and with handwriting it is -12%. It could be that students did not have as much room to improve in a short amount of time with the handwritten products verses the word processed products. This is not evidence that educators should abandon their pursuit of handwriting or word processing for students. It simply implies that students have a background of handwriting, though not always successful, and that students are motivated to perform using technology as is evident in the increase in performance within a four week time period. It is extremely difficult to motivate students with mild disabilities to engage in tasks when they have been so unsuccessful in the past. It is encouraging that these students are willing to take the risk of failure once again. The results are increased performance in almost all aspects of writing, handwriting and word processing, when taught story webbing and to use visual thinking software. The implications are that students could benefit from both modes of production, handwriting and word processing, and being taught to use story webbing and visual thinking software.

One area that is particularly interesting is the 26% gain in story construction on the handwriting samples and the 24% gain in story construction with word processed samples (see Table 15). The reason this is important is because story construction most closely parallels the intended functional purpose of story webbing--organizing ideas. Story construction measures the "student's use of prose, action, sequencing, and dimension" (Hammill & Larsen, 1996, p.30). Evidently, this indicates that story webbing

has a positive, consistent influence across both modes of production--handwriting and word processing. Therefore, students with mild disabilities who are taught to use the strategy of story webbing and to use visual thinking software in producing written products show increases with regard to writing quality when word processing or handwriting. In addition, there are significant increases in the quantity of writing when using the word processor, and a basic maintaining of production when handwriting.

Students Not Taught Story Webbing and Visual Thinking Software

Considering the results attributed to research question 2, when students with mild disabilities practice their writing skills daily, without being taught story webbing and to use the visual thinking software Inspiration, there was an increase in the quality and quantity of their written language performance. The three word processed samples of students who were not taught story webbing and to use visual thinking software illustrate that there are statistically significant differences regarding the quality of their writing on all measures except contextual convention (see Table 16). The subtest of story construction show percentage gains of up to 58%. The glaring implication is, *have your students write everyday*. These students are showing wonderful improvements without strategy instructions, they are simply writing every day with purpose.

There are statistically significant differences found when examining all measures of the quantity of word processed writing products. This means that students wrote more as they progressed through the study, they wrote twice as much at the posttest compared to the pretest. For any student to increase the amount they write by 100% within four weeks is almost a dream come true. But for students who have such a history of failure in writing to increase their writing by 100% is almost unbelievable, yet it is a reality. This is

such intriguing news. This group is not benefiting from story webbing or visual thinking software, instead, they are simply writing every day, and using technology everyday. Any academic setting can provide daily purposeful writing, and even though there might not be a laptop for each student daily, most school environments have some technology present. The implications are that writing every day and using word processors as much as possible, preferably every day, can result in increases in the quality and the quantity of student writing.

In contrast, when the handwritten writing samples are compared, there is only one area of statistically significant difference found with regard to quality or quantity of writing. The one area of improvement is with contextual conventions (see Table 16), the very area which had shown the least change on all other testing situations for both groups. The fact that there are no differences evident between pretest and posttest with regard to handwritten products, yet gains of up to 53% with the word processed samples, does not appear to be by chance (see Table 17). The only thing that is different is the mode of production, handwriting versus word processing. Two possible causes come to mind: first, the students are excited about and more willing to engage in activities using technology, they simply performed better using the word processor. Second, it could be that their keyboarding skills are improving to such a degree that they are simply able to produce twice the volume of writing at the posttest level. If the latter is indeed the case, it is wonderful to think that in four weeks students with mild disabilities can improve their writing performance simply by developing and practicing keyboarding skills enough to increase their production by up to 100%. This presents a great argument for daily technology use for students as a compensatory tool. Any increase in student performance

by 50% within four weeks is a success. However, an increase at the end of four weeks for students who struggle to produce a paragraph is a tremendous improvement. If students feel successful they will participate.

In this study, the results indicate that it does not matter whether or not students are taught story webbing and to use visual thinking software, the quality and quantity of the writing products improved even though they are not taught story webbing when word processing. However, for students who are not taught story webbing and to use visual thinking software, it did matter whether they handwrote or word processed their products. When word processing, students increased the quality of writing by up to 58% and maintained the quality of their handwriting products, except in one area, which shows substantial improvement. Students increased the amount they wrote by approximately 100% when word processing, yet produced approximately the same amount when their products were handwritten. These results lead to the conclusion that even though larger gains are found in the word processing performance of students with mild disabilities who are not taught story webbing and visual thinking software, the increases are not consistent across modalities. This indicates that students should write everyday, and that they should be allowed to use word processors as often as possible for their writing tasks. Because of the substantial difference in performance when these students use word processors compared to handwriting, additional research is needed to determine if this difference in performance between modalities remain consistent over time as keyboarding skills improve.

Comparing Intervention and Comparison Groups

There is not a statistically significant difference in the quality or quantity of the written language performance for students with mild disabilities when they are taught story webbing and to use visual thinking software compared to students with mild disabilities who are not taught story webbing and to use visual thinking software. When the quality of word processed written language performance of both groups combined is examined across time, there are statistically significant differences on T-units, as well as all measures of the spontaneous subtest of the *TOWL-3*, with the exception of the contextual convention (see Table 18). This means that both groups show an increase in their performance, and that there is not a significant difference between the two groups. Basically, this means that it did not matter when students word processed their products, or whether they were taught story webbing and visual thinking software, as they all showed improvement. While this is not the expected outcome, it is actually very good news for the students and their teachers, because it indicates that all students participating in writing practice using a word processor, whether taught story webbing or not may show an increase in the quality of their performance with time.

When both groups are combined and the quantity of writing on the word processor is examined, statistically significant differences are found on all three measures across time. This indicates that when both groups are combined there is an increase in performance between the pretest, mid test and posttest. Once again, it did not matter whether a student was taught story webbing or not, they all wrote more at the end of the study when using a word processor. The gains that are shown by students in both groups, ranging from a 50% to 109% increase in production, are really exciting. This is a group

of students who struggle to translate their ideas into written form and yet they showed increases of this magnitude. It would be valuable to know whether these increases would continue over time.

When time by treatment is examined, there are only two areas that even approached significance, story construction and word count, leading to the conclusion that the effect of story webbing may not be as important as the effect of practicing writing over time, especially using the word processor. Given that there is clear evidence of a linear increase (see Table 19), meaning they increased at approximately the same rate from pretest to mid test to posttest, this appears to not have been just by chance.

Simply and clearly, this means that by writing everyday and using the word processor, an increase in the quality and the quantity of writing for both groups was produced, and there was not a substantial difference between the two groups. Many educators are desperately seeking a way to help their students who are having difficulties with writing. This research certainly indicates that students should start today with daily writing and use a word processor. The results of this study obviously indicate this is a powerful combination in improving student writing as it is obvious in all aspects of this study. Whenever technology was added to the equation, the motivation of the students increased as evidenced by entries recorded in the Instructor Observation Logs.

However, when the performance of the two groups is compared using the pretest and posttest handwriting samples (see Table 19), there are three areas of statistically significant difference found in the quality of handwritten products: contextual convention, composite scores, and quotient scores. This means that there were statistically significant differences found over time in these areas, that the students in

both groups increased their performances significantly in these areas from the pretest to the posttest, and that there was not a substantial difference between the two groups in their performance. Therefore, both groups showed improvement in the quality of handwritten products whether they were taught story webbing and visual thinking software or not. However, the intervention group seems to have had an edge in the consistency in their percentage gains. The quality of their handwriting was very similar to their performance with the word processed products (see Table 21). As stated before, the gains were not as large as for the comparison group on the word processed products, however they were consistent whether produced using handwriting or word processing. This indicates that the group that was taught story webbing and to use Inspiration made more *consistent* gains than the comparison group. That leads to the conclusion that there is a difference in the handwriting performance of students when they are taught story webbing verses not taught story webbing. That difference is not statistically significant, however, it does represent an increase in the quality of writing performance using handwriting. It would point in the direction of a structured situation providing more consistency and therefore foster more consistency in the students. It might be preferable to have a smaller percent gain but across all modes of production and situations.

No statistically significant differences in performance were found between pretest and posttest regarding the amount handwritten by either group. It appears that teaching story webbing and using visual thinking software results in little or no improvement in the quantity of handwritten products. However, it should be noted that the amount handwritten versus word processed products at the time of the pretest is substantially different and this means that students in both groups produce more in handwriting

initially than with word processing. The speculation is that because students in this study began with poor keyboarding skills, they have more room to show improvement as compared to handwriting. This cannot be dismissed because students did enter the study with poor keyboarding skills and they did finish with a great deal more keyboarding skills. This suggests that students realized the need for good keyboarding skills, and were willing to work for those skills, because they experienced the benefit.

When the intervention group and comparison group's word processing samples are compared the patterns are similar, except that the intervention group showed about one third to one half as much increase as the comparison group. Although there was a higher percentage gain with the comparison group compared to the intervention group, the differences were not statistically significant. Also, while the comparison group showed higher percentage increases, the intervention groups showed more consistent performances whether handwriting or word processing. The results from this study show that over time students can improve the quality of their writing whether they are taught to use story webbing and visual thinking software or not. The practice effect of writing daily, especially using the word processor, appears to be key to improvement in writing performance. While this study was conducted over a period of four weeks and shows evidence of improvement in the majority of areas examined, there is a need to examine the effects of teaching story webbing and visual thinking software over a longer period of time to determine whether the short time frame had a negative influence on the outcome of the study. Meanwhile, educators should have their students write every day and use technology at every opportunity.

Students' Self-Perceptions

Students' perceptions were measured through the individual completion of the SAS and through face-to-face interviews of the students in the intervention group. Students' self-perceptions changed regarding written language tasks when using story webbing and visual thinking software to produce their written language. The results from the analysis of the SAS yielded statistically significant improvement between the pretest and the posttest level in the areas of attitudes about writing and writing strategy usage (see Table 23). All three areas are very similar in the increase they exhibited from the responses on the pretest to the responses on the posttest, with gains of 8%, 10% and 11%, respectively. This means that there were similar improvements in all three dimensions of the SAS, attitudes about writing, computer usage, and strategy usage. The implication is that students who were taught story webbing and to use Inspiration, showed consistent improvements in their self perceptions along these dimensions.

On the student interview questions the same three dimensions were present. With regard to questions concerning student attitudes about writing, many of the student responses remained relatively the same from the pretest to the posttest. However, it is noteworthy that at the conclusion of the study, one-third of the students continued to express negative opinions about themselves as writers. These negative statements about writing abilities are contrary to the research by MacArthur et al. (1991) who concluded that students with disabilities, and even those without, who received instruction in word processing, expressed overly positive, often unrealistic comments about their writing.

It would seem beneficial to incorporate more specific information about what makes for "good writing" in student writing instruction. When asked, what do other

people think about your writing, many students profess that they do not know, or express discomfort at the thought of sharing their writing. Several students express discontent with their writing. For example, student #1 shared some interesting feelings about writing:

> "I wish I was like when I was a youngster. I had better handwriting when I was little." During the posttest he added, "I would change it back to the way it used to be. When I was little I used to get A's in handwriting. But now I'm having lots of trouble with spelling. If I want to use a big word and don't know how to spell it. I have to change words."

Interestingly, this student had some of the highest performances on writing samples, yet he obviously lacked confidence in his abilities, even to the point of choosing less complex words to use. This provides a powerful example of the importance of understanding how a student may feel about his or her abilities, as that can effect how they are to judge their own competencies. Measures should be taken to increase perceptions of self-efficacy for students to engage in activities. As this study illustrates, students can improve their writing by engaging in writing activities, but their attitudes (reflected in the SAS and in the SIQ) do not improve as dramatically. Daily writing and discussions about "good writing" is strongly indicated. When students were taught story webbing and Inspiration, pretest responses and posttest responses to the statement, "I enjoy writing" increased by 14%.

There are some interesting responses on the questionnaire regarding using computers. On the student survey there is an upward trend to the answers, but not enough to represent a statistically significant difference. Nonetheless, on the question, "is there a difference in your writing when using a computer?" 23% of the students showed more positive responses at posttest than at pretest. Several students specifically mentioned that

tools such as spell check and grammar check are helpful to them. This information supports the idea presented by Espin et al. (2000), Lewis (1998), and Outhred (1989) emphasizing the importance of students having well developed keyboarding skills, and knowledge of the features of the computer before they could truly reap the benefits of using technology. It is not enough just to give students a computer and think it is going to make a statistically significant difference, students need to be taught the skills and be given practice time to develop the necessary skills. It appears from the student responses and the increases in the quantity of writing evident on the word processed writing samples that keyboarding skills and knowledge of the features available on computers is a powerful component to improving the written expression of students. As the students in this study gained skills, they increased their performance tremendously. It appears so basic to recommend that if computer usage can increase the writing performance, then computers should be used, however, that is exactly where the results of this study lead. If students are interested, motivated, and believe that technology can be beneficial to them, then every effort should be made to provide them with technology.

With regard to writing strategies, there were modest changes in student responses regarding how they planned what they would write. "Think about what to write before I start" continues to be the most popular response with five at pretest and five at posttest. The most noteworthy change is at the posttest. For example, one student said that he "jots down his ideas," and two other students stated that they "use story webbing." It was speculated that student responses would reflect they used story webbing, or at least some form of observable planning, at the point of the posttest. However, this was not the case. Despite the disappointment that students did not change their responses to a significant

degree regarding planning, their responses appear to be accurate in the sense that instructors reported that they did not observe many students planning, even during posttest. Fifty-five percent of the students stated that they should plan before they write, at the time of writing however, only two were ever observed to implement this practice. This supports the idea that the study did not allow enough time for writing strategies to become automatic. It appears that four weeks is not enough time for a state of automaticity to develop, so it is suggested that story webbing and the use of Inspiration to produce writing products should be implemented for longer durations. Changes developed in the sense that quality, quantity, and attitudes had increased, however, this study covered many materials and strategies in a very short period of time. It seems appropriate to suggest that more than four weeks is needed for this type of instruction. Even though the changes are modest, when students are taught story webbing and to use the visual thinking software Inspiration, there were increases in their self-perceptions regarding their attitudes about writing, computer usage and writing strategies.

Observed Changes

It is interesting to note the changes in instructor's observational entries regarding students' writing skills and general behaviors toward writing. During the first week student comments quoted in the Instructor's Observation Logs were all negative with the exception of one; however, by the fourth week it is almost the opposite. Teacher observations reflect a similar pattern of change. This positive change over time occurred across all three dimensions. Instructors reported that students willingly engaged in more academic tasks and seemed to have more confidence as the study progressed. Therefore,

it appears that the structure of the study provided success and fostered more positive attitudes for the students.

Teachers noted this more positive attitude as evident in student academic as well as social behavior. Initially, student comments concerning writing reflected a very critical view of themselves as writers, including expressions of frustration or even defiance about participating in writing activities. However, as time progressed, these negative comments and behaviors were observed much less frequently. Instructors reported that all students definitely wrote longer products, and that the students expressed less verbal resistance to writing. Therefore, when students were taught to use story webbing and Inspiration, the instructors perceived students to have more positive attitudes and increased writing engagement. The implications are that if student attitudes can be positively influenced, then students will increase their engagement in academic activities, even those activities they do not enjoy, and the ultimate result will be an increase in academic performance.

Instructors commented that students were excited about using computers from the very start, and they concluded that one of the most powerful motivators for behavior and performance was daily access to computers. This experience indicates that for reluctant writers such as the ones in this study, technology can be a powerful motivator to engage in activities they naturally avoid. As the results in this study illustrate, if students write every day, there should be improvement. If a classroom does not have computers, there are usually computers in the school libraries as well as the public libraries. If technology can motivate the reluctant student, then by all means access to the technology should be provided.

As students' keyboarding skills improved, instructors commented unanimously that student confidence levels increased. Teachers noted an interesting change in student responses during follow up questioning about computer usage. Some students realized that their computer skills were problematic, and expressed the need to improve keyboarding skills. The implications of these observations are that technology use can serve as a motivator for the students from the beginning and as their skills improve, student confidence improves and so does their behavior. With these benefits in mind, technology should be available for students to use as often as possible, preferably on a daily basis.

One issue that concerned the instructors was the volume of work and new skills required of the students in the intervention group. Instructors mentioned several times that they experienced feelings of being rushed and that they observed a sense of being overwhelmed on the part of the students. It appears appropriate to suggest the concept of cognitive overload might apply (Sweller & Chandler, 1991). This concept suggests that new information remains in working memory until that information is fully attended to, processed, and reaches a state where it becomes automatic and can be implemented with minimal thought. It is possible that because the study was only four weeks in duration there was not enough time for the new concepts to become automatic; therefore, the efficient application of the newly learned story webbing skills would require conscious thought and effort by students, and perhaps actually represent an increase in work load. Considering these issues, the students still showed consistent increases in their writing performances, leading to the speculation that if an educator had students for an entire

semester or a school year, the possibilities for improvement may be more pronounced because of the increased likelihood that the skills would become automatic.

Instructors' comments at the conclusion of the study unanimously supported the observation of positive changes in all of the students during this study. All teachers concurred that daily writing and story webbing would be a part of their own classroom activities in the future, and given the results of this study it appears that this is a logical recommendation.

Instructors also observed that students simply appeared to feel better about what they were doing. They wrote longer stories, with less resistance. Instructor's felt that teaching story webbing and the Inspiration software within such a short time frame may not have been as beneficial as it would be if it were taught and practiced daily over a longer period of time. Unfortunately, the luxury of an extended time was not offered during this particular study. One instructor concluded by saying "If we see these differences in one month, what could we see in one year?" That suggestion appears to be on target, a longer period of time is needed for the strategy to become automatic for students.

Limitations and Future Research Implications

As with all studies there are limitations within this study. The five limitations of concern are: the size of the population; the fact that not all academic environments have the same amount of technology used during this study; the instructor to student ratio; only one type of strategy was taught; and perhaps most importantly, the four-week time frame allowed for the study.

First, there were 18 students in this study with the students being divided into two groups of nine each. Because of the small population, the results are more likely to be influenced by the performance of one or two participants. It would be valuable to have a larger group of students, perhaps 20-30 in each group, for a total of 40-60 students.

Second, each student within this study had a laptop assigned to them for the duration of the study. This involved a total of nine laptops because the groups alternated academic time. Even though many educational facilities are purchasing classroom sets of laptops it would be very difficult for a class to have all the laptops everyday for an extended period of time. However, one question that needs to be addressed is whether increases demonstrated by students were actually due to word processing versus daily writing. Therefore, some related research can be pursued without technology.

Third, the instructor–student ratio (3:1) is ideal. A teacher does not often have the opportunity to work so closely with such a small group of students. This ratio makes this study difficult to replicate exactly due to the instructor-student ratio alone.

Fourth, students were only taught the writing strategy of story webbing during this study. While there is evidence that story webbing could be helpful for many students with mild disabilities, there is also evidence that students could benefit from being taught a variety of writing strategies, with and without a technology component, from which to choose. Certainly, the results of this study indicate the possible positive effects of teaching story webbing and the use of visual thinking software, as well as the use of technology, in the writing performance of students with mild disabilities. Therefore, it stands to reason that computers should be used for word processing and story webbing should be taught to students with mild disabilities; however, future research is also

needed to explore the effects of teaching a variety of strategies to students and of matching individual students with specific strategies that address their individual strengths and weaknesses.

Finally, the duration of the study should be lengthened. Four weeks might not be sufficient time to properly develop students' skills, have them become automatic, and to yield measurable changes. It needs to be determined whether the difference can be attributed to cognitive or information overload, or whether there might be some other reason. Future studies similar to this one are needed, except that each concept should be taught, practiced thoroughly, and allowed to reach a state of automaticity before introducing the next concept. If in fact, cognitive load played a part in the differences in performance, reaching a state of automaticity should alleviate this situation.

Summary and Conclusions

Despite these limitations, or perhaps because of them, the study's findings have educational implications and point to future studies. Students show increases on all components of this study whether they are taught story webbing and visual thinking software or not, and whether they are using technology to write or not. All students demonstrated gains within a very short time of only four weeks.

Consistent gains in the writing quality and quantity of students who were taught story webbing and to use the visual thinking software Inspiration are revealed. Research shows that students with mild disabilities lack the organizational skills necessary to plan their writing responses. Story webbing alone can provide just that, it can provide a visual structure to organize ideas and thoughts for students who lack those skills. These are the students mentioned early in this study, who have great ideas but lack the ability to

organize information. Story webbing should be taught, practiced, and even re-taught until it becomes automatic. It can provide the needed structure for planning writing responses. In addition, the story webbing concept can be implemented anywhere with no tools, all that is needed is the knowledge of how it works.

Inspiration is the visual thinking software chosen for this study because it offers all the advantages of story webbing and it has the added advantage of being technology based. It is intriguing to students who like technology, lack organization, and want or need a better presentation method. It seems appropriate to suggest that an ideal academic arrangement for students with mild disabilities with poor written expression skills would be to use story webbing and Inspiration to produce all written assignments.

The fact that students write much more at the pretest compared to the post-posttest with word processing, coupled with the fact that several students mention the advantages of using computer tools such as spell checker and grammar checker, is encouraging. Students appeared to shift their excitement regarding using computers, which remained high throughout the study, from the novelty of computer usage, to the functional benefits of using a computer. It is noteworthy that students quickly began to realize that their lack of keyboarding skills was a deterrent to their computer performance. Most students mentioned the need to improve their keyboarding skills, and all students exhibited substantial improvement during the study. This area appears to be crucial, if technology is available, the students will learn to use it because they are interested and motivated. However, actual keyboarding practice is an important component to being truly successful on the word processor. Technology cannot serve as a tool unless students know how to use it. During the four weeks of this study, the

keyboarding skills of the students reveal dramatic improvement and all students should be given that opportunity for success. Educators need to make sure that students are getting the keyboarding skills they need. The suggestion is to have students write every day and have them keyboarding every day.

Students consistently demonstrated performance increases on measures of writing quality and quantity, with the students in the group who were not taught story webbing and visual thinking software showing more percent gains than the intervention group. Nevertheless, there are similar patterns shown throughout the study, such as story construction being the subtest which shows the highest gain with both groups, and contextual convention being the subtest of least gain for both groups. Despite the gains demonstrated by both groups, the group who were not taught story webbing continually exhibited a substantially larger gain than the intervention group.

Observations by the instructors point toward the intervention group being inundated with information to the point of being overwhelmed and not reaching a state of automaticity on the new strategy before the next is introduced. Instructors concur that in their opinion, the intervention group did too much, too fast, and did not reach a point where the strategies became automatic. Future studies can help to address the dilemma of why the comparison groups made higher gains in many areas. This study should be replicated over the course of a full academic year to allow for the strategies to reach a state of automaticity for the students.

The instructor's believe that teaching story webbing and the Inspiration software within such a short time frame may not have been as beneficial as it would have been if taught over a longer period of time, allowing for automaticity at each stage. They

emphasized that students in the intervention group were overwhelmed with information. Further, the instructors declared their own sense of being overwhelmed when teaching content to the intervention group. What kind of writing performance can be achieved if the students are given daily computer usage, daily story webbing, and daily use of the visual thinking software Inspiration, with time for automaticity to be reached before introducing the next concept, over the course of one year.

As this study progressed, students were observed to have a better attitude about what they were doing, and they engaged in writing tasks with less and less resistance. Students wrote more as their products improved in quality as well as quantity. Many of the students were obviously motivated by technology usage.

The results show that students participating in this study improved the quality of their writing whether they were taught to use story webbing and visual thinking software or not. The students who were taught the strategy of story webbing and to use the visual thinking software Inspiration had more consistent gains across modalities; however, the students who were not taught story webbing and Inspiration actually show greater gains when motivated to engage in writing tasks. The next step is to replicate this study with a larger population and over a longer period of time. There are encouraging results from this study and it simply needs to be continued. If students can experience increases in four weeks, it is logical to pursue this line of study to determine whether the increases continue. The conditions for this study can be modified so that at least some components of this study can be implemented in any classroom.

In conclusion, this research study points in the direction of achieving better writing performance as the result of using story webbing with a population traditionally

shown to have poor written expression performance. The fact that in this study strategy instruction did not hold the key to short term improvement in performance in written expression skills actually simplifies the issue. The component that appears to make the most immediate difference is having the students write every day and giving them positive experiences with the writing process. Also, the factor of daily technology usage cannot be ignored. Is it possible that the keyboarding practice and increased comfort with the computers alone would show improvements in written performance? While numerous questions remain to be more fully explored the results from this study indicate that students with mild disabilities can indeed make significant improvements in their writing, and in a short period of time.

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APPENDICES

Appendix A Student Demographic Information

Student Demographic Information

Please fill in the blanks:

My complete name is: _____.

My birth date is: _____.

I am _____ years old.

In August I will be in the _____ grade.

I go to _____ School.

My phone number is: _____.

My address is: _____.

I have _____ brothers and _____ sisters.

I was born in the state of: _____.

I was born in the town of: _____.

Circle the correct answer:

I am: Male Female

I live with my: Mother Father Both Parents Grandparent (s) Guardian

I know how to use a computer to write a paper: Yes No

I use a computer often: Yes No

I need help with my: Reading Writing Math

Ethnic Group: African American American Indian Asian Caucasian (white) Hispanic

Appendix B Student Attitudes Survey

Student Attitudes Survey (SAS)

Instructions: Circle the choice after each statement that indicates your opinion.

Practice questions A and B.

A.) I would like to eat pizza everyday.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

B.) My favorite television program is "Survivor."

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

1. I enjoy writing.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

2. I think that using a writing strategy is not very important.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

3. I know how to write a story using a computer.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

4. I am a good writer.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

5. I plan what to write before I start.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

6. I have good typing/keyboarding skills.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

7. It helps me to picture in my mind what I want to write.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

8. It does not matter how I write, as long as I finish the job.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

9. It is easier to write a story when I use a computer than when I use paper and pencil.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

10. It helps me to organize my ideas before I write.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

11. When I work on writing assignments, I feel comfortable with my writing ability.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

12. Using a strategy helps me write better.

Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree

Note: Scoring Convention

Questions scored	Questions 2 and 8 reverse scored
Strongly agree = 6	Strongly agree = 1
Strongly disagree = 1	Strongly disagree = 6

Appendix C Student Interview Questionnaire

Student Interview Questionnaire (SIQ)

1. How do you plan what you will write?
2. What do you think of yourself as writer?
3. What do other people think about your writing?
4. What is more important when you are writing, getting finished or doing a good job?
5. Do you find it helpful to proofread your own work?
6. What sort of mistakes do you look for when you proofread your work?
7. Is there any difference in your writing when you use a computer?
8. Do you find it easier, harder, or the same when you handwrite your work compared to using a computer?
9. When you start to write and you are struggling, what do you do?
10. If you could choose between writing by hand, or on a computer, which would you choose? Why?
11. If you could choose between taking a multiple-choice test or writing a paper about a topic, which would you choose? Why?
12. If you there was one thing that you could change about your writing, what would it be?

Appendix D Story Webbing Instructions

Story Webbing Instructions

Story Webbing.....Planning Phase

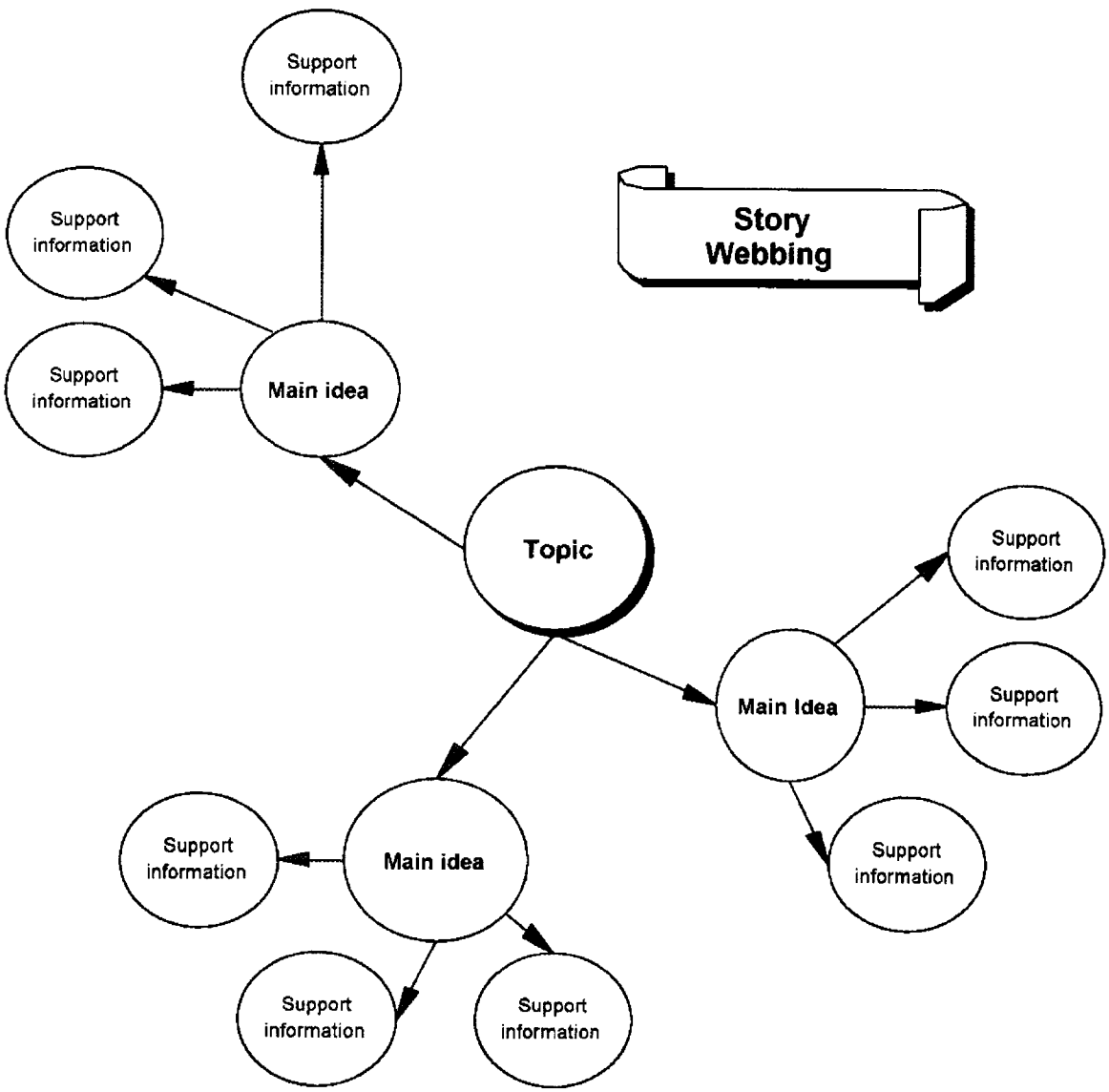
1. Begin w/ a circle in the middle of your page.
2. Inside the circle write your topic.
3. Draw three lines outward from your circle. Point them in different directions.
4. At the end of each line, draw another circle.
5. In each new circle, write a main idea about your topic.
6. From each of your main idea circles, draw three lines outward, in different directions.
7. At the end of each line draw a circle.
8. In each circle, write the information that supports that main idea.

Story Webbing .....Writing Phase

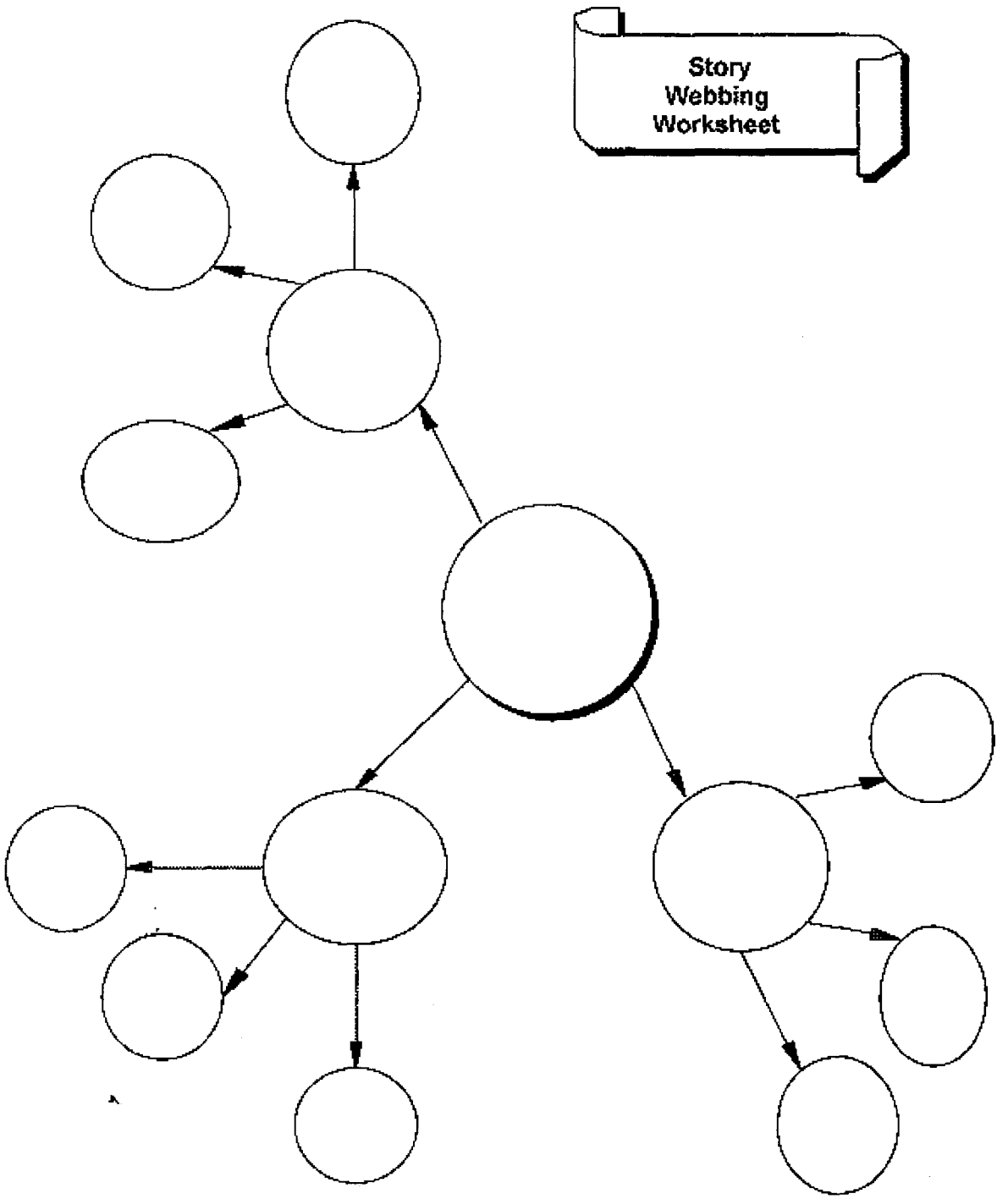
1. Compose your first paragraph by writing a sentence stating your topic. Follow with a sentence about each of your main ideas.
2. For paragraph 2 write a sentence about your main idea. Next, write a sentence about each of your supporting ideas until you have used each of them. Continue with paragraph 3 and 4.
3. For your conclusion, state your topic sentence and write a sentence about each of your main ideas.
4. Check to make sure you have included all of your ideas. Proof read for any changes. Now, you should have a well planned 5 paragraph product.

Appendix E Story Webbing

Story Webbing



Appendix F Story Webbing Worksheet


Story
Webbing
Worksheet

Appendix G Informed Consent Form

INFORMED CONSENT FORM
FOR RESEARCH BEING CONDUCTED UNDER THE AUSPICES OF
THE UNIVERSITY OF OKLAHOMA - NORMAN CAMPUS
PERMISSION FOR MY SON/DAUGHTER TO PARTICIPATE
IN A RESEARCH PROJECT

I understand that this form is about my son/daughter participating in the study: Does technology enhance thematic unit-based learning? I understand that the persons responsible for this project are Ms. Regina Blair and Dr. James Gardner, Department of Educational Psychology, at the University of Oklahoma. They can be reached at 405-325-5974.

The purpose of this study is to explore whether teaching strategies, delivered in the context of thematic units (e.g., a 4 week unit on "The Rainforest") with technology applications (e.g., use of the world wide web, multimedia projects, daily writing prompts, etc.), enhances a student's learning. The objectives of the study are to: (1) examine how well we can integrate technology enhancements into the curriculum; (2) identify effective strategies that help students enhance their writing skills within a thematic unit with technology-based activities; and (3) observe and document your child's learning and motivation as a participant.

During a 4-week period, your child will spend approximately 2-3 hours of their day receiving instruction and/or working in the context of a thematic unit. There will be an emphasis upon writing and computer usage. At scheduled intervals, his/her class work will be videotaped, and we will ask you son/daughter questions about how they think their learning is going. Throughout the 4 weeks we will make copies of your son/daughter's work and also take notes about what we observe. At the end of the 4 week period we interview and videotape your son/daughter thoughts regarding how they thought story webbing, visual thinking software and other technology enhanced their learning.

This study's academic procedures are essentially no different from other educational practices that take place in general and special education classrooms. From this standpoint, there are no foreseeable or additional risks beyond those that your son/daughter may encounter during a typical day during this study. The benefits of participation in this study include: (1) discovering ways that story webbing and visual thinking software can influence the quality and quantity of the written performance of your son/daughter; (2) discovering that technology enhanced thematic units are a novel and fun way to encourage the participation of your son/daughter in writing activities; and (3) providing teachers with knowledge regarding how to effectively integrate strategies and technology into their writing curriculum.

At any time during the study, you or your son/daughter can refuse to be video taped, refuse

our copying of class materials, or quit the study. It is important to know that all students in the study will receive full and equal benefits of the technology-enhanced thematic unit. Furthermore, granting your son/daughter permission does not waive any of your or your son/daughter's legal rights.

All information collected in this study will be kept confidential. No publication or presentation will contain any information that identifies your son/daughter by name or personal information. All copies of written products, field notes, and videotapes will be stored in a locked file cabinet in the office of Ms. Blair. All of this information will be destroyed after 5 years or when no longer needed.

You may contact Ms. Regina Blair at 405-325-7936 (rbblair@ou.edu) or Dr. Jim Gardner at 405-325-1533 (jgardner@ou.edu) if you have any questions about the research. If you have questions about your or your son/daughter's rights as a research participant, you can call the Office of Research Administration at the University of Oklahoma at 405-325-4757.

Permission to Participate in Study

I, _____ hereby give permission for my
(Signature of Parent or Guardian)

son/daughter, _____, to participate in the above
(Print Child's name)

described research. I understand that my son/daughter's participation is voluntary and that my son/daughter, or I may withdraw at any time.

Please check one of the following statements:

_____ Yes, I agree to allow my son/daughter to be videotaped.

_____ No, I do not want my son/daughter to be videotaped.

Appendix H Informed Assent Form

INFORMED ASSENT FORM
FOR RESEARCH BEING CONDUCTED UNDER THE AUSPICES OF
THE UNIVERSITY OF OKLAHOMA - NORMAN CAMPUS
STUDENT PERMISSION TO PARTICIPATE IN A RESEARCH PROJECT

I understand that this form is about the study: Does technology enhance thematic unit-based learning? I understand that the persons responsible for this project are Dr. James Gardner and Ms. Regina Blair, at the University of Oklahoma. They can be reached at 405-325-5974.

During a 4-week period, Ms. Blair, Dr. Gardner, and other instructors in this project will explore my writing and computer usage during a unit on "The Rainforest." I will be using a computer to complete much of my work. The things I do on the computer and my writing assignments are going to be the primary focus of this study.

I will probably spend 2-3 hours of my project day working on the "Rainforest" unit. I understand that there will be times when my work is videotaped, that someone will take notes about my work, and that I will be asked questions about my learning. At the end of 4 weeks, I will be interviewed and videotaped about how I thought story webbing, visual thinking software, and computer usage helped me.

The things I will be doing during the class time of this study are the same type of things I do in school everyday. The benefits of being in this study may be finding out how technology helps me do my schoolwork, discovering that technology can help me with my writing, and learning writing strategies that can be helpful.

I do not have to participate in this study. At any time during this study I can refuse to be videos taped, or refuse to allow Ms. Blair or Dr. Gardner to see or have copies of my work. I can quit the study at any time. If I give my permission to be in this study I am not waiving any of my legal rights.

All information collected will be kept confidential. No paper or presentation will contain any information that identifies me by name or personal information. If there are times that Ms. Blair or Dr. Gardner want to show someone a picture and/or short video clip of me working, they will first ask my mother, father, or guardian. All copies of my work, notes, and videotapes will stored in a locked file cabinet in the office of Ms. Blair. All of this information will be destroyed after 5 years or when no longer needed.

I can contact Ms. Regina Blair at 405-325-7936 (rbblair@ou.edu) or Dr. Jim Gardner at 405-325-1533 (jgardner@ou.edu) if I have any questions about the study. If I have questions about my rights as a research participant, I can call the Office of Research Administration at the University of Oklahoma at 405-325-4757.

Permission to Participate in Study

I, _____ hereby agree to participate
(Please print your name)

in the above described research. I understand that my participation is voluntary

and that I may withdraw at any time.

_____
(Please sign your name)

Please check one on the following statements:

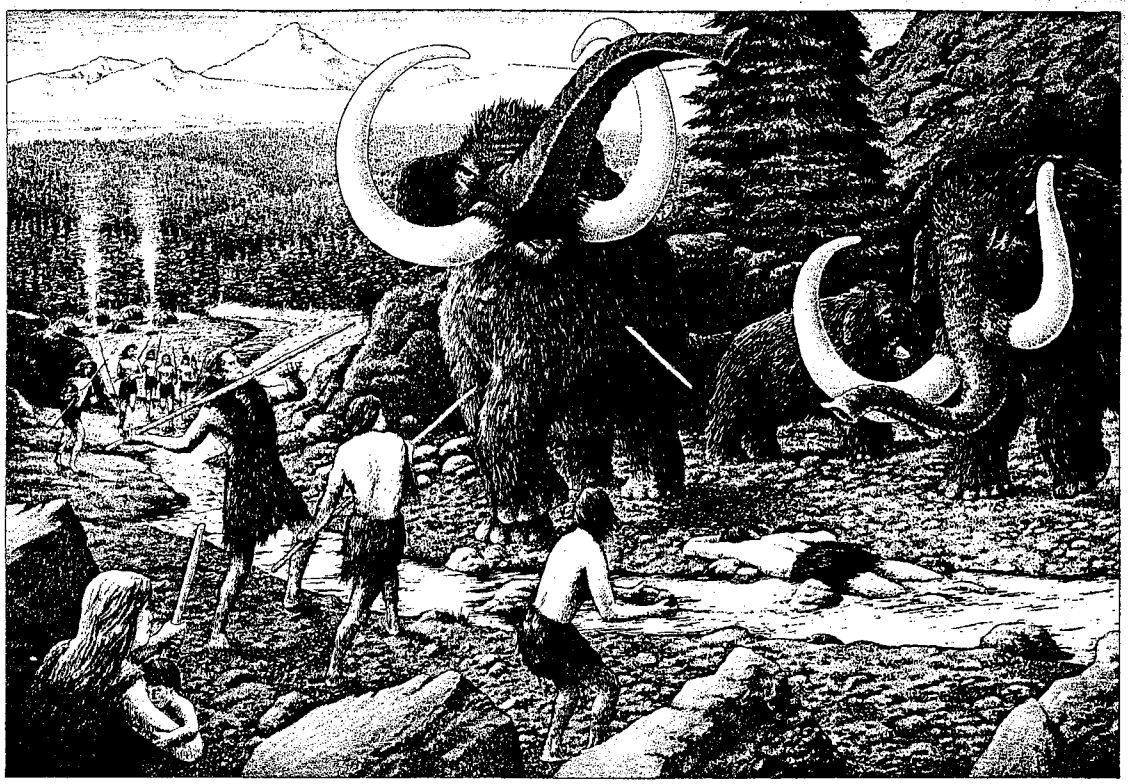
_____ Yes, I agree to be videotaped.

_____ No, I do not agree to be videotaped.

Appendix I Student Sample Using *TOWL-3* Form A for Handwritten Pretest

(Form Reprinted with Permission)

STORY



A long, long time ago dinosaurs lived. There where all kinds of them some people call them lizards, but when the ice age came most of the dinosaurs died. One type of Dinosaur didn't die is the Woolymamith. Caveman and Wemen were alive during that time also. The hunted the mammoth. Some lived and some died but most of the time cavemen were. The killed for food and clothes only. They didn't have guns like we do so they used rocks and speirs.

To be Contenude...

Appendix J Instructions for Writing Prompts

Instructions for a Picture Prompt

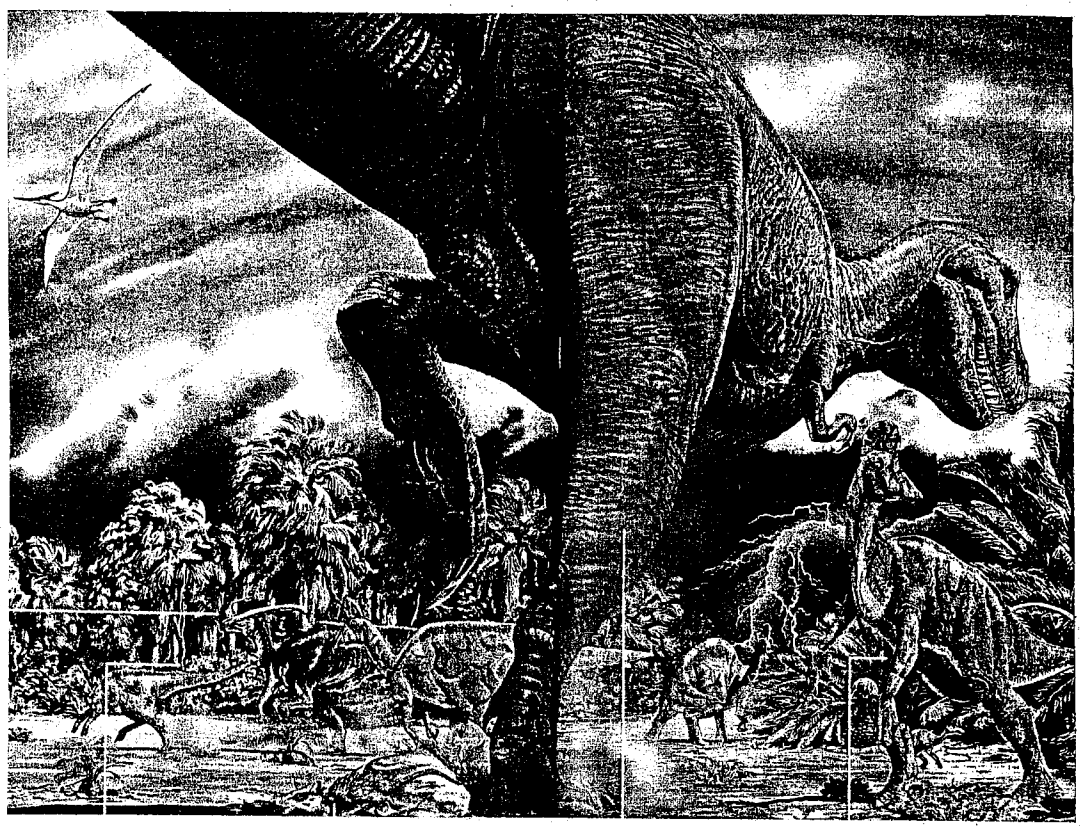
"This exercise is designed to see how well you can write a story. Look at the picture before you. You are to write a story about the picture. Before you begin writing, you might take time to plan your story. Remember, a well-written story usually has a beginning, middle, and end. It also has characters that have names and perform certain actions. Correct punctuation and capitalization will make your story easier to read. After you have made a plan for your story begin writing. Try to write as long a story as you can. If you need anything, just let one of the instructors know..... Write the best story you can. Ready? Begin." (Modified from Hammill & Larson, 1996, p. 13)

Instructions for a Verbal Prompt

"This exercise is designed to see how well you can write a story. Listen to the beginning of the story. You are to finish the story that I start. Before you begin writing, you might take time to plan your story. Remember, a well-written story usually has a beginning, middle, and end. It also has characters that have names and perform certain actions. Correct punctuation and capitalization will make your story easier to read. After you have made a plan for your story begin writing. Try to write as long a story as you can. If you need anything, just let one of the instructors know..... Write the best story you can. Ready? Begin." (Modified from Hammill & Larson, 1996, p. 13)

Appendix K Student Sample Using Picture Prompt for Word Processed Pretest

Word Processed Pretest - Student Sample

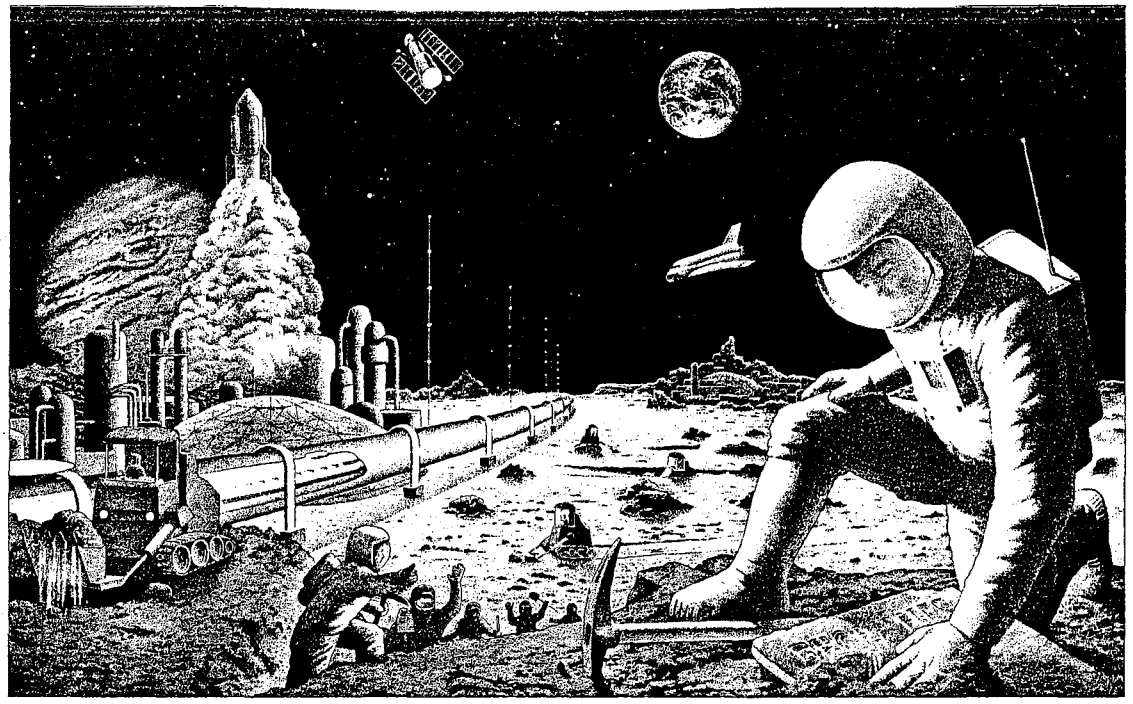


A long time ago dinosaurs lived on the earth. There was plant and meat eaters. The biggest meanest dinosaurs that walked the earth was the T-rex.

One of the stronger dinosaurs was the Triceratops. It fought t-rex like is wasn't nouthing.

Appendix L Student Sample Using *TOWL-3* Form B for Handwritten Posttest

(Form Reprinted with Permission)



In space there are things that we cant see or do. One thing is the life. But we can see the planets. But what do people or things eat.

Scientist are trying to find life in space. They sind people out. They also sind machines. They hope to find come kind of allen.

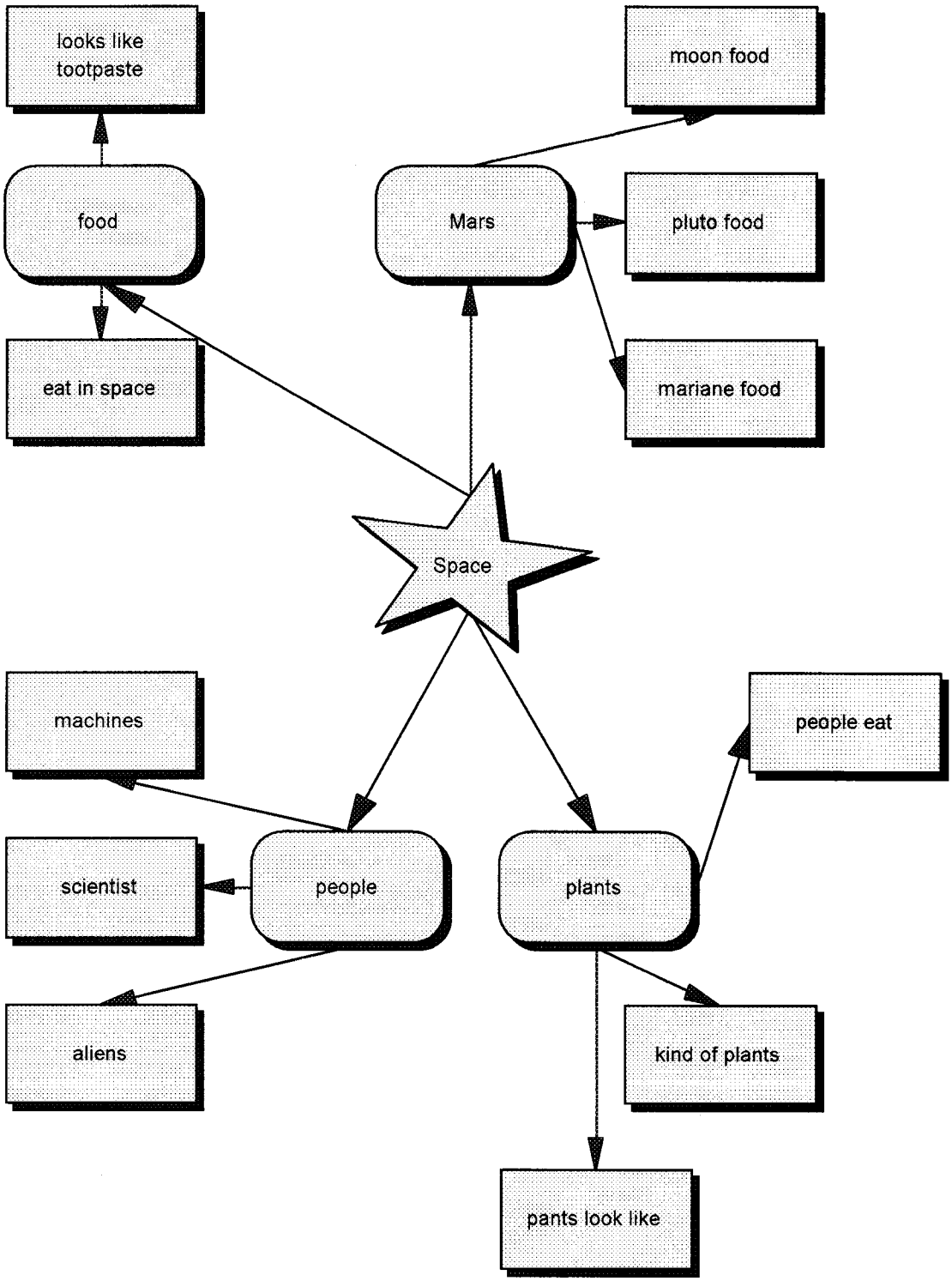
But what do they eat on the way. Most say that they eat tablet like food. Others say That they eat regular food. But the mistery is what do the allens eat.

So people are sent to differnt planets. One of them is the moon. another is Mars. We are hoping to go even to Pluto.

The End

Student Sample Story Webbing Using Inspiration

For *TOWL-3* Form B Word Processed Posttest



Appendix M Student Sample Using Picture Prompt for Word Processed Posttest

Word Processed Posttest - Student Sample



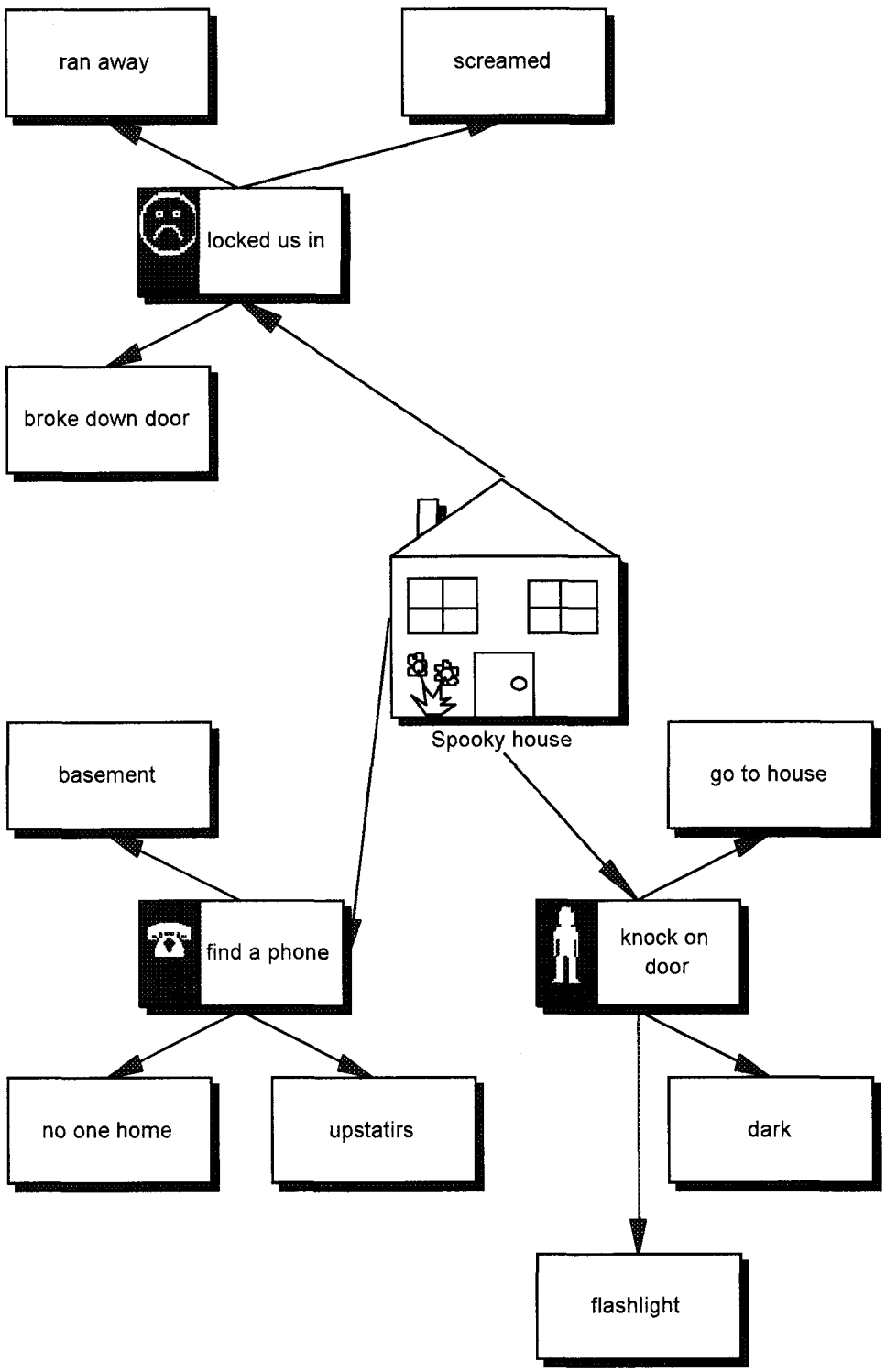
So I went to the door and knocked the door opened so I jumped. My friend walked up to the house and saw me on the ground and she was laughing. She helped me up and we walked in side but there was too dark to see so we looked doe alight switch. We couldn't find one so we got a flashlight from my car.

We went back too the house and looked for a phone but we didn't find one. We went up stairs to see if anyone was home but to our surprise it was no one there. We went downstairs and saw another door it lead down stair in to a basement so we went down me first.

The door shut it hind we were locked in so she screamed and we were stuck. I found an ax and knocked off the door handle. We ran and got in her car and never came back again.

Student Sample Story Webbing Using Inspiration

For Word Processed Posttest



Appendix N *TOWL-3* Scoring Form

(Reprinted with Permission)

TOWL-3

Test of Written Language

Third Edition

Form A ☐ **Form B ☐**

PROFILE/STORY SCORING FORM

Section I. Identifying Information

Name _____ Male _____ Female _____

	Year	Month	Day
Date Tested	_____	_____	_____
Date of Birth	_____	_____	_____
Age	_____	_____	_____

School _____ Grade _____

Examiner's Name _____

Examiner's Title _____

Section II. Record of Subtest Scores

Subtest	Raw Score	%ile	Std. Score
1. Vocabulary (VO)	____	____	____
2. Spelling (SP)	____	____	____
3. Style (ST)	____	____	____
4. Logical Sentences (LS)	____	____	____
5. Sentence Combining (SC)	____	____	____
6. Contextual Conventions (CC)	____	____	____
7. Contextual Language (CL)	____	____	____
8. Story Construction (StC)	____	____	____

Section III. Record of Other Test Scores

Name	Date	Std. Score	TOWL-3 Equiv.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Section IV. Computation of Composite Scores

TOWL-3 Composites	Standard Scores: VO	SP	ST	LS	SC	CC	CL	StC	Sum of Std. Scores	Quotients
Contrived Writing	☐	☐	☐	☐	☐				= ☐	( )
Spontaneous Writing						☐	☐	☐	= ☐	( )
Overall Writing	☐	☐	☐	☐	☐	☐	☐	☐	= ☐	( )

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Subtest 7
Contextual Language

Score		Items and Scoring Criteria
	1.	Fragmentary sentence **0** = yes **1** = *no*
	2.	Run-on sentence **0** = yes **1** = no
	3.	Compound sentences **0** = *none* **1** = 1 **2** = 2–3 **3** = 4 or more
	4.	Introductory phrases or clauses **0** = *none* **1** = 1–2 **2** = 3–5 **3** = more than 5
	5.	Uses coordinating conjunctions other than *and* (*but, or, nor, for, yet, so*; e.g., "I ran *but* he caught me"; "Do this *or* that") **0** = no **1** = 1–3 **2** = 4 *or more*
	6.	Subject–verb disagreements **0** = more than 1 error **1** = 1 error **2** = perfect, no errors
	7.	*Sentences in paragraph(s)* **0** = 1 paragraph, 1 sentence **1** = 1 paragraph, 2 or more sentences **2** = 2 or more paragraphs, 2 or more sentences in at least 1 paragraph **3** = 2 or more paragraphs, 2 or more sentences in at least 2 paragraphs
	8.	Composition is composed of **0** = mostly fragments, run-ons, or badly constructed sentences **1** = mostly simple sentences with prepositional phrases **2** = a *variety of simple, compound, and complex sentences complete* with embedded clauses
	9.	Sentences in composition **0** = are random, not well related to each other **1** = contribute to the development of topic or theme
	10.	Names objects shown in picture **0** = *none* **1** = 1–3 items **2** = 4 or more items
	11.	Number of correctly spelled words having seven or more letters (count a word only once) **0** = 0–3 **1** = 4–7 **2** = 8–14 **3** = 15 or more
	12.	Number of words with three syllables or more that are spelled correctly (count a word only once) **0** = 0–2 **1** = 3–4 **2** = 5 or more
	13.	Uses *a* and *an* appropriately **0** = uses neither *a* nor *an* **1** = uses *a* appropriately at least once **2** = uses *an* appropriately at least once
	14.	Vocabulary selection **0** = sparse, immature **1** = more or less adequate **2** = rich, mature
	Raw Score	

Subtest 6
Contextual Conventions

Score		Items and Scoring Criteria
	1.	All sentences begin with a capital letter **0** = no **1** = yes
	2.	Paragraphs **0** = none, 1 **1** = 2 **2** = 3–4 **3** = 5 or more
	3.	Uses quotation marks (" or ") **0** = no **1** = yes
	4.	Uses comma to set off a direct quotation **0** = no **1** = yes
	5.	Uses an apostrophe in a contraction (e.g., isn't) **0** = no **1** = yes
	6.	Uses a colon, semicolon, or hyphen (:, ;, -) **0** = no **1** = yes
	7.	Uses a question mark (?) **0** = no **1** = yes
	8.	Uses an exclamation point (!) **0** = no **1** = yes
	9.	Capitalizes proper nouns (e.g., Oz, Bob, Italy, Italian, Earth) **0** = no **1** = sometimes **2** = yes, always
	10.	Overall punctuation and capitalization is **0** = poor **1** = average **2** = good
	11.	*Number of nonduplicated words misspelled* **0** = 6 or more **1** = 3–5 **2** = 0–2
	12.	Spelling is **0** = poor **1** = average **2** = good
	Raw Score	

Subtest 8
Story Construction

Score		Items and Scoring Criteria
	1.	Story beginning **0** = none, abrupt **1** = weak, ordinary, serviceable **2** = interesting, grabbing
	2.	Story somehow relates to picture **0** = no **1** = yes
	3.	Definitely refers to a specific event occurring before or after the picture **0** = no **1** = yes
	4.	*Story sequence* **0** = none, a series of random statements **1** = rambles, but has some sequence **2** = moves smoothly from start to finish
	5.	Plot **0** = none, *incoherent, statements in random order* **1** = weak, meager, spotty **2** = logical, complete
	6.	Characters show feelings/emotions **0** = no **1** = some emotion/low-affect story line **2** = strong emotion clearly evident in at least one characte
	7.	*Expresses some moral or philosophic theme* **0** = no **1** = yes, but weakly stated, inferred **2** = overtly, clearly stated
	8.	Story action or energy level **0** = no action **1** = boring, tedious **2** = run-of-the-mill, predictable **3** = exciting, interesting
	9.	Story ending **0** = none, abrupt **1** = weak **2** = logical, definite ending
	10.	Prose is **0** = immature **1** = ordinary, serviceable, matter-of-fact **2** = artful, stylish
	11.	Story is **0** = dull, merely describes picture **1** = simple, straightforward **2** = interesting, unique, coherent
	Raw Score	

Section VI. Profile of Test Scores

Subtest Scores										Composite Scores				Other Test Scores								
Std. Scores	Vocabulary	Spelling	Style	Logical Sentences	Sentence Combining	Contextual Conventions	Contextual Language	Story Construction	Std. Scores	Quotients	Contrived Writing	Spontaneous Writing	Overall Writing	1	2	3	4	5	6	7	8	Quotients
20	•	•	•	•	•	•	•	•	20	150	•	•	•	•	•	•	•	•	•	•	•	150
19	•	•	•	•	•	•	•	•	19	145	•	•	•	•	•	•	•	•	•	•	•	145
18	•	•	•	•	•	•	•	•	18	140	•	•	•	•	•	•	•	•	•	•	•	140
17	•	•	•	•	•	•	•	•	17	135	•	•	•	•	•	•	•	•	•	•	•	135
16	•	•	•	•	•	•	•	•	16	130	•	•	•	•	•	•	•	•	•	•	•	130
15	•	•	•	•	•	•	•	•	15	125	•	•	•	•	•	•	•	•	•	•	•	125
14	•	•	•	•	•	•	•	•	14	120	•	•	•	•	•	•	•	•	•	•	•	120
13	•	•	•	•	•	•	•	•	13	115	•	•	•	•	•	•	•	•	•	•	•	115
12	•	•	•	•	•	•	•	•	12	110	•	•	•	•	•	•	•	•	•	•	•	110
11	•	•	•	•	•	•	•	•	11	105	•	•	•	•	•	•	•	•	•	•	•	105
10	•	•	•	•	•	•	•	•	10	100	•	•	•	•	•	•	•	•	•	•	•	100
9	•	•	•	•	•	•	•	•	9	95	•	•	•	•	•	•	•	•	•	•	•	95
8	•	•	•	•	•	•	•	•	8	90	•	•	•	•	•	•	•	•	•	•	•	90
7	•	•	•	•	•	•	•	•	7	85	•	•	•	•	•	•	•	•	•	•	•	85
6	•	•	•	•	•	•	•	•	6	80	•	•	•	•	•	•	•	•	•	•	•	80
5	•	•	•	•	•	•	•	•	5	75	•	•	•	•	•	•	•	•	•	•	•	75
4	•	•	•	•	•	•	•	•	4	70	•	•	•	•	•	•	•	•	•	•	•	70
3	•	•	•	•	•	•	•	•	3	65	•	•	•	•	•	•	•	•	•	•	•	65
2	•	•	•	•	•	•	•	•	2	60	•	•	•	•	•	•	•	•	•	•	•	60
1	•	•	•	•	•	•	•	•	1	55	•	•	•	•	•	•	•	•	•	•	•	55

Appendix O T-units Score Sheet

T-units Score Sheet

(circle one) Instructor: A B C

Evaluation of T-units:

- one main clause plus any subordinate = 1 T-unit
- simple or complex sentence = 1 T-unit
- compound sentence = 2 T-units
- punctuation is ignored

T-unit count:

- section off all T-units using the rules above
- count the total number of T-units

	Pretest HW	Pretest WP	Mid test	Posttest HW	Posttest WP	Post-posttest
Student 1						
Student 2						
Student 3						
Student 4						
Student 5						
Student 6						
Student 7						
Student 8						
Student 9						
Student 10						
Student 11						
Student 12						
Student 13						
Student 14						
Student 15						
Student 16						
Student 17						
Student 18						

Appendix P IRB Permission Letter

The University of Oklahoma

OFFICE OF RESEARCH ADMINISTRATION

March 6, 2001

Dr. James E. Gardner
Educational Psychology
University of Oklahoma
CAMPUS MAIL

Dear Dr. Gardner:

The Institutional Review Board-Norman Campus has reviewed your proposal, "Does Technology Enhance Thematic Unit-Based Learning?," under the University's expedited review procedures. The Board found that this research would not constitute a risk to participants beyond those of normal, everyday life, except in the area of privacy, which is adequately protected by the confidentiality procedures. Therefore, the Board has approved the use of human subjects in this research.

This approval is for a period of twelve months from this date, provided that the research procedures are not changed significantly from those described in your "Application for Approval of the Use of Humans Subjects" and attachments. Should you wish to deviate significantly from the described subject procedures, you must notify me and obtain prior approval from the Board for the changes.

At the end of the research, you must submit a short report describing your use of human subjects in the research and the results obtained. Should the research extend beyond 12 months, a progress report must be submitted with the request for re-approval, and a final report must be submitted at the end of the research.

Sincerely yours,

Susan Wyatt Sedwick

Susan Wyatt Sedwick, Ph.D.
Administrative Officer
Institutional Review Board-Norman Campus

SWS:pw
FY01-236

Cc: Dr. E. Laurette Taylor, Chair, Institutional Review Board
Ms. Regina Blair, Educational Psychology

1000 Asp Avenue, Suite 314, Norman, Oklahoma 73019-0430 PHONE: (405) 325-4757 FAX: (405) 325-6029

Appendix Q *TOWL-3* Permission Letter

pro-ed
An International Publisher

June 30, 2003

Regina B. Blair
820 Van Vleet Oval #313
Norman, OK 73019

Dear Ms. Blair:

This letter is to acknowledge your request and grant you permission to include the following information **only** in the appendices of your dissertation. Regarding the *Test of Written Language-Third Edition* by Donald D. Hammill and Stephen C. Larsen, you may include:

A) Profile/Story Scoring Form
B) Picture prompt page from Form A & B Student Response Booklets

We appreciate your interest in our products for your research study. If you have any further questions or requests, please contact me at 800-897-3202, extension 668, or by e-mail at *awaldrop@proedinc.com*. Good luck with your dissertation.

Sincerely,

Amber Waldrop
Data and Materials Manager
Test Development

8700 Shoal Creek Boulevard Austin, Texas 78757-6897 Phone 512/451-3246 Fax 512/451-8542 1-800/897-3202