THE EFFECT ON THE WRITING OF STUDENTS WITH DISABILITIES WHEN COMMERCIAL SOFTWARE IS USED AS AN ACCOMMODATION IN THE WRITING BLOCK OF FOUR BLOCKS

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ABSTRACT

THE EFFECT ON THE WRITING OF STUDENTS WITH DISABILITIES WHEN COMMERCIAL SOFTWARE IS USED AS AN ACCOMODATION IN THE WRITING BLOCK OF FOUR BLOCKS

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The purpose of this research was to determine whether commercial software programs were an effective accommodation for students with disabilities during the Writing Block of Four Blocks. Seven students authored five samples of writing without any accommodation to determine baseline data for the dependent variables, which were number of words, number of misspellings, percentage accuracy, and quality as assessed through a rubric. The students then used Write Outloud for three weeks for the first intervention, and CoWriter in conjunction with Write Outloud for the second intervention. The data were then compared across the phases for each dependent variable. For individual students, the improvements in writing varied. For the group as a whole, performance improved in the dependent variables of number of words, number of misspellings, percentage accuracy, and rubric score. Conclusions were drawn that the effects of using a commercial software program in the Writing Block were positive. However that individual student needs and preferences should serve as a guiding force as to which software should be used.
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“The race was very fun. The car was very fast. He lost the race.” (translation: The race was very fun. The car was very fast. He lost the race.)

This sample of writing is typical of that produced by my students with special needs during the Writing Block of the Four Blocks literacy framework. As a special education teacher working in general education classrooms, I continually see how my students struggle to successfully complete the activities of the Writing Block. They have difficulty producing work with enough correctly spelled words to make sense. They frequently use simple words, because they know how to spell them. Their writing lacks organization and creativity, because it is so challenging for them to simply write. It also takes them much more time to complete writing than their general education peers.

A study by Mayes, Calhoun, & Crowell (2000) shows the prevalence of a learning disability in written expression compared to other learning disabilities in students referred for intervention. These students were referred to a clinic for suspected learning disabilities and/or Attention Deficit with Hyperactivity Disorder. Sixty-five percent of the 119 students evaluated had a learning disability in written expression. This was two times the number that had a learning disability in reading, math, or spelling. Other studies in learning disabilities look at what particular language arts areas may be affected by a learning disability in written expression. In a study by Brooks et al. (1999), seventeen students with learning disabilities were referred for writing intervention. Fifteen of the students had scores that were significantly below their verbal IQ scores in the areas of spelling, composition, and word recognition. In a study by DeLaPaz (1999), many of the difficulties students with learning disabilities have in writing are outlined. Students with learning disabilities are more likely to have errors in spelling, punctuation, and
capitalization. Their writing contains more errors in word usage, and their texts are shorter, and more likely to be illegible (DeLaPaz, 1999).

Students with special needs are regularly included in classrooms that use the Four Blocks literacy framework. As more schools join the Four Blocks method of teaching, it will become increasingly important to have a variety of tools available to help students with special needs learn through this framework. Patricia Cunningham, one of the key developers of Four Blocks stated that to “be successful in teaching all children to read and write, we have to do it all! Doing it all means incorporating daily the different approaches to beginning reading. The Four Blocks—Guided Reading, Self-Selected Reading, Writing, and Working with Words—represent four different approaches to teaching children to read” (Cunningham, Hall, & Sigmon, 1999, p. 3). A former administrator in an urban district in Ohio said that “literacy-reading, writing, and learning is the foundation for all other achievements in a child’s school years and beyond” (Moberly, 2002, p. 1). Helping students with special needs to be successful in reading and writing would give them more opportunity for success in school and life. A toolkit of assistive technology such as computer software could “enhance productivity as lifelong learners... and it has important implications for special education and related services personnel when considering how to help students with disabilities achieve high standards” (Edyburn, 2000, p. 15). My research question is “What are the effects on writing when commercial software programs are used as an accommodation for students with special needs in the Writing Block of a Four Blocks classroom?”
CHAPTER II

Synthesis of the Related Literature

The review of the literature will summarize how accommodations can be made to help students with special needs function in a Four Blocks classroom. This will be accomplished through a description of Four Blocks and a discussion of accommodations that can be made in writing for students with special needs.

Four Blocks

The Four Blocks framework consists of four different literacy blocks: Guided Reading, Self-Selected Reading, Writing, and Working with Words. A description of the blocks can be found in the book The Teacher’s Guide to the Four Blocks (Cunningham et al., 1999). The guiding idea is that by doing all Four Blocks children will learn to read and write. The authors believe that one or more of the blocks will support the way that a child learns best. They also emphasize that children function on different literacy levels and that Four Blocks addresses this by the variety of ways that the activities in each block support literacy development. Cunningham et al. stress that the variety of activities within each block makes the blocks as multileveled as possible and therefore provides support for students who are struggling, including those with special needs. They (1999) suggest that special education teachers who come into the classroom to help students on Individualized Education Programs (IEP), come during Guided Reading or Writing. It is their belief that in these blocks students benefit the most from an extra teacher, and that these two blocks are the ones with which students with special needs require the most help.

In practical implementation of the Four Blocks method, it may be necessary to pull students with special needs out for part of the Writing Block. It is important to either do full inclusion for the Writing Block or a combination of pullout and inclusion. Total pullout for the Writing Block is not recommended.
Description of the Blocks

Working with Words. The goal for Working with Words is to help students read and write independently (Cunningham, et al. 1999). This goal is accomplished through the development of two skills. The first skill is to develop decoding ability through phonics activities, and the second is to automatically recognize and spell high frequency words.

Cunningham et al. (1999) describe several phonics activities that help students to decode unfamiliar words by looking for patterns in words. One component of the block that helps to develop phonemic awareness is Making Words. This activity is teacher directed. Each student has a set of cards with letters on them, and the teacher directs the students to make a word with specific letters. Then students are directed to change that word to a different word by changing a certain number of letters. Next, this word is changed to another word. The words are also placed into a pocket chart, so that all students can see the correct way to spell the words. Phonics is also addressed by rhyming activities that focus on working with words with the same spelling pattern that rhyme.

Cunningham et al. (1999) also describe the activities that develop the skill of automatically recognizing and spelling high frequency words. The major component of Working with Words that accomplishes this skill is the Word Wall. Five high frequency words are selected by the teacher to be placed on the word wall. The class chants these words and does several activities with them, such as drawing their shape and playing guessing games with them.

Working with Words is a block in which students with special needs can often function independently, because it includes many examples and moves at a slow pace. The answers are also written on the board or placed in a pocket chart, so all students can make sure they have the correct answer.
Self-Selected Reading. The Self-Selected Reading Block is where children select something they want to read. This Block is described in The Teacher's Guide to the Four Blocks (Cunningham, et al., 1999). It includes several key components. The first is teacher “read aloud”, where the teacher reads to the students. The teacher selects books from a variety of literature genres, and may read all or part of the books. The students then select a book to read on their instructional levels. There are generally book baskets in the classroom that have a variety of books at various levels from which the students can choose. While the students read the books they have selected, the teacher holds conferences with students. At these conferences, the teacher can have the students read a small portion aloud and can monitor progress and see if the students are picking books they are capable of reading. The teacher can also check for comprehension and make anecdotal notes about the students’ progress. At the end of the block, a few students share with the whole class information about a book they have been reading. Some classrooms also have book boards where students recommend or criticize books.

Self-Selected Reading is easy to adapt to fit the needs of students with special needs. This block is multileveled because of the variety of reading levels from which students select their reading. Teachers can steer students toward books that are appropriate for them.

Guided Reading. Guided Reading is the block that focuses on comprehension. Cunningham, Hall, and Cunningham (2000) describe this block in Guided Reading the Four Blocks Way. Teachers choose material for the students to read. The teacher also gives a purpose for reading, and guides the students to use reading strategies needed to read the selection and to meet the purpose. Guided Reading includes a variety of materials, such as big books, basal readers, magazines, trade books, content area books, and/or newspapers. Guided reading usually includes an activity before reading, a format for how the students will read the selection, and an activity after reading. The activity before reading allows the teacher to help students to make
predictions, set a purpose for reading, start a graphic organizer, learn vocabulary, make connections to their own experiences, and/or build on prior knowledge. Some suggestions for how students can read the selection are partner reading, echo reading, choral reading, book club groups, or individual reading when students are given specific information to find in the reading. The activity after reading usually focuses on discussing the reading selection, following up predictions, acting out the story, discussing what they learned or what strategies were used, and/or completing the graphic organizer that was used prior to reading.

Writing. The Writing Block is when students write in a similar fashion to Writer’s Workshop. Writer’s Workshop is the term used to describe the writing process when students choose topics, write, revise, edit, and publish (Cunningham, et al., 2003). One purpose for this block is that some children learn to read by writing. Another goal of the Writing Block is for students to learn to write fluently and to apply grammar and mechanics rules to the writing process. Cunningham et al. (1999) believe that struggling students can sometimes read their own writing before they can read other things. The Writing Block begins with a mini-lesson that lasts about ten minutes. The teacher talks out loud about her thoughts while writing, and models one key skill each day. One day it might be how to pick a topic, while another day it might be the proper way to write a letter. The teacher also makes sure to utilize the Word Wall on a frequent basis, so that students begin to use it as well. The next major activity is for children to write their own work, while the teacher is busy conferencing with individual students. The students are at differing stages of writing: starting a new piece, revising, editing, or illustrating. The student generally produces three or four different pieces before they move into publishing one of the pieces, at which time spelling and mechanical errors are fixed. The teacher may also use a conference to see where students are on a piece, or they may use it only for students who are ready to publish. At the end, a few students share their writing in an author’s chair. They can
share a work in progress or a finished piece. Other students can ask questions or give advice to the author.

In conclusion, Four Blocks is a framework for literacy instruction. The first Block is Working with Words which has a focus on spelling and word study. The second Block is Self-Selected Reading, where children select a book to read independently. The next Block is Guided Reading, which has the main purpose of improving comprehension through teacher selected activities and books. The final Block is writing when students first participate in a mini lesson on a writing skill, and then students work on producing written work of their own. Through participation in all Four Blocks, all students achieve through one of the Blocks that will best help them in their literacy skills.

**Accommodations**

*Importance of Accommodations*

"Accommodations are changes in the input and output processes in teaching and assessment such as: the format of instructional presentations and test practice and/or preparation activities (Smith, Polloway, Patton, & Dowdy, 2001, p. 434).” Smith et al. (2001) also pointed out that these accommodations are the key to a successful inclusion experience.

Accommodations are a mandated part of the IEP process. The Ohio Department of Education Model Policies and Procedures for Special Education states that the "IEP team ensures that a full range of services is available to effectively meet the unique and educational needs of each child with a disability regardless of the environment(s) where the child is served. These services, which shall be indicated on the IEP, include instructional services, and supplementary aids and services, including assistive technology services.” These services could range from “high tech” software options to “low tech” changes in the way students attempt or complete the assignments.
Effective Accommodations in the Writing Block 8

Accommodations in Writing

Accommodations other than software

Several low-tech accommodations could be made to help students with special needs achieve more success in writing. The main accommodations for writing that are not software based are graphic organizers, tape recorders, and spell checkers that are handheld. Graphic organizers help students organize their writing. Smith et al. (2001) suggested that the use of graphic organizers help students think about what they are writing. Cunningham and Allington (2003) suggested the use of a web to help students organize their writing. Other examples of graphic organizers for writing are located in the Teacher’s Guide to the Four Blocks (Cunningham, et al., 1999). Students could tape record their written assignments, rather than writing them out (Smith, et al., 2001). Edyburn (2000) suggested that all classrooms have handheld spell checkers readily available for students as they write. This low-tech tool can easily be carried to all the student’s classrooms. While the low-tech options do not have an extensive research base, they may be valuable because of their low economic cost and the ease of implementing them in the classroom.

Software as an accommodation for writing

Computer Software Spell checkers. Spell checkers can help students with special needs by helping to identify misspelled words and providing possible suggestions for the student’s target word. Several studies have focused on their use with students who have special needs (Montgomery, Karlan & Countinho, 2001; Pracek, 1996). One study indicated that without accommodations, students with learning disabilities are two to four times more likely to have spelling errors than their general education peers (MacArthur, Graham, Haynes & DeLaPaz, 1996). Their lack of spelling ability may cause many problems for students with special needs. Spelling could interfere with their writing processes by causing students to focus on correct
spelling and subsequently forget their ideas for their writing projects. Students may limit their vocabulary to writing words that they know how to spell. They may also stop writing before they have completed an assignment because they were frustrated with trying to spell words. One possible aid to assist special needs students in spelling would allow them to use word processing programs that have spell checkers. The spell checkers find words that are misspelled and help students replace them with the correct spelling.

How effective are spell checkers in helping students with learning disabilities correct their spelling mistakes? Are the spellcheckers limited in their effectiveness by the severity of the misspelling? These two questions guided two different causal-comparative research studies (MacArthur et al., 1996; Montgomery et al., 2001). These two studies used different word processors, yet had similar results. Montgomery et al. (2001) researched nine different spell checkers. They sought to evaluate the spell checkers by taking 974 words from 199 writing samples created by students with learning disabilities and typing them into the word processor. A check was then done with the software's spellchecker. They specifically wanted to find out if the target word for misspellings was first in the replacement list and if words misspelled by students at lower phonetic levels (i.e. preprimer, primer) would have the target word in the replacement list at all. They also wanted to know if the amount of correct letter sequences (bigram ratio) affected the success of the spellchecker at generating the target word. The combined results for the nine spell checkers showed that the target word was provided 47.5% of the opportunities, with it being first only 21.6%. They concluded that none of the spell checkers was effective at producing the target word first in the replacement list. The placement of the target word in the list was affected by the number of correct letters in sequence there were and how closely the misspelling was to its phonetic spelling. Montgomery et al. (2001) also concluded that the effectiveness of spell checkers was limited, because of their inability to help students who grossly misspell words.
MacArthur et al. (1996) did a similar causal-comparative design that also looked at the effectiveness of ten spell checkers. This two-part study first focused on identifying the effectiveness of spell checkers and then focused on the ability of the students to use spell checkers to correct their spelling errors. The participants in the study were students with learning disabilities in grades five through eight. Their writing samples were analyzed to develop a list of 555 misspellings. These words were typed into the different word processors and data were recorded on target word in list, length of list of suggested words, and target word position in the list. The results showed that the target word was suggested 53% of the opportunities. More severe misspellings resulted in the target word appearing in the suggested list only 23% of the opportunities. The researchers concluded that spell checkers were somewhat limited in their effectiveness, but also wondered if the student's spelling ability would affect the performance of the spell checker. This provided the foundation for the second part of the study.

MacArthur et al.'s second study was done with 27 students with learning disabilities. The students were evaluated by the Test of Written Spelling to obtain pretreatment data that would later be compared to posttreatment data to determine if the success of correcting spelling errors was related to spelling achievement. The students were given instruction on the use of a spell checker. Students wrote a composition for two days, but were not allowed to use spell checkers. On the third day, they were given printouts of their compositions and asked to edit them. They were also instructed to circle words that they thought were misspelled and correct them. The next week, the students went back and corrected their original documents with a spell checker. Without using a spell checker, students identified 28% of their errors and corrected 9%. With the use of a spell checker, students found 63% of their errors and corrected 37%.

When the target word was in the list of suggestions, the students could correctly select it 81% of the opportunities. The researchers also suggested that if students were instructed and
provided with strategies in using spell checkers, the proportion of the errors corrected may rise (MacArthur, et al., 1996). Using spell checkers in correlation with other software can begin to enhance its effectiveness.

**Talking Word Processors.** A talking word processor translates text into speech and gives students the opportunity to hear the words that they are typing. This may help students to monitor their writing (MacArthur, 1999). It may help students notice incomplete sentences or errors in meaning or spelling (MacArthur, 1999). In another study, MacArthur (1996) highlighted the use of a talking word processor with a sixth grader, Mark. Mark had a severe reading disability which hindered his writing because his spelling was challenging to decipher. Many times even he was unable to read what he had written. Mark had increased success through using a personal dictionary combined with the use of a talking word processor. The talking word processor benefited Mark by providing him a check on the accuracy of his writing.

Borgh and Dickson (1992) investigated the use of a talking word processor with a group of 48 elementary students. They looked at five dependent variables: length, editing, quality, motivation, and audience awareness. They concluded that length, audience awareness, and quality did not improve with the use of the software. There was improvement noted in editing and motivation. Forty of the 48 students thought it was more fun to write with the software. Students also improved in their attempts at editing with the software. There were three to seven times more changes made through editing when using the software. Talking word processors help students when they write by providing audio feedback while the students are typing.

**Word Prediction software.** Other software programs that may be beneficial to students with special needs are word prediction programs. Several studies have focused on their benefits (Edyburn, 2000; MacArthur, 1999; Merbler, Hadadian & Ulman, 1999; Williams, 2002). In one study, word prediction software was used in combination with word processing software.
MacArthur (1999) described how it works. The word prediction software opens in a separate window. As the student types, the software predicts what word the student is trying to type. The student could click with the mouse and the word is inserted into the sentence. Word prediction software programs had a personalized word bank in which words frequently typed by the user started to show up sooner than they had previously. MacArthur concluded that word prediction software could be more valuable than spell checkers in certain ways. If a student types the initial sounds correctly, they could get the correct spelling for the word with the word prediction software thereby avoiding at least some errors from the outset. The research articles reviewed for this paper on word prediction were all based on one to three participants. The findings were interesting, but the small sample size causes generalizability to be limited.

Word prediction is of benefit because it reduces the amount of keystrokes required to type. It also is beneficial because it can be used in combination with a talking word processor, and it can help students ranging from preprimer to college. Williams (2002) conducted a case study with a student with special needs who used word prediction software. Williams chose to highlight one student in the case study because she felt he would be helped the most by the software. Williams and the teacher involved felt that the software was not helpful to all students. They thought it was most beneficial for those students who knew what they wanted to write, but had difficulty composing it into readable text. A seventh grade student, J.T. who wrote at a preprimer level fit this profile perfectly. He had difficulty producing writing that could be read. Some of the difficulties in writing that J.T. had were incorrect use of periods and capital letters and that he usually only wrote the first sounds of words correctly. Based on MacArthur et al.'s research (1996), this made him a good candidate for success with a word prediction program. The main assignments J.T. used the program to type were daily journal entries. Williams (2002) described several encouraging things that occurred throughout the time the software was used. J.T. initially
asked nine questions a day, but went down to less than three a day as the study progressed. The length of his writing went from an average of 36.9 words to 60.28 words. The quality of his writing was evaluated on a 7.0 scale, with 7.0 being the highest. His quality score went from 2.78 during baseline to an average of 3.5 with the use of the software. The most inspiring results were in the motivation that J.T. developed for writing. He said writing was fun and asked to use the software at other times of the day. Word prediction software could also be beneficial by increasing the independence that students with special needs have in producing writing samples. They had previously tried having J.T. dictate his writing to a scribe, but J.T. did not like having other people know he could not write and it was not always possible to have a scribe for every writing period. Williams concluded that instruction in assistive technology can enhance its use with students with disabilities, and she emphasized the need for technology to be tailored to meet the individual needs of students.

Another case study that focused on the benefits of word prediction software was done by MacArthur (1999) and utilized three elementary students with learning disabilities who had severe spelling problems. This study also involved journal entries. However, the researcher used an alternating treatments design with three different conditions for writing: handwriting, word processing, and word prediction software. They hoped to draw conclusions on which treatment was of most benefit to students. Baseline data were collected from three writing samples. The students were given individual instruction in how to use word prediction software. A research assistant (RA) was utilized to record data. The RA wrote notes about the student’s questions and interactions with teachers. The RA also transcribed as the students read their journal entries to the teacher. In addition, the RA recorded the length of time used to write the journal entries. The writings were then scored based on the amount of legible and correctly spelled words. There were no significant differences among the number of legible words in any of the three conditions.
There was no difference in correctly spelled words for two of the students, but one student had a slight increase in correctly spelled words with the word prediction software, which MacArthur attributed to his increased usage of the word prediction list in comparison to his two classmates. He used the list 70% of the opportunities, while his classmates used it less than 10%.

MacArthur (1999) questioned how this could differ so dramatically from previous studies in which clear benefits in spelling and legibility had been found when students used word prediction software. The program that was used for this study had a 10,000-word dictionary. MacArthur questioned if changing the writing assignment to more effectively use the software would change the results. This led to a second study that was reported in the same article. In fact, the second study utilized the same participants. The writing assignment was changed to dictation from the RA who read a passage that was at the student's reading level. The study also utilized an alternating treatments design between the three methods of producing writing: handwriting, word processing, and word prediction. This study showed improvement in spelling and legibility for two of the three students with the use of word prediction software. MacArthur discussed how word prediction can be useful for students in improving writing samples, but cautioned that consideration must go into its use. MacArthur emphasized that for the program to be successful, students must constantly attend to the list of words. In addition, differing word prediction programs should be considered based on the individual needs of the student and the assignment. Word prediction software was shown to improve the writing of some students.

**Dictation software.** Another type of software that could be considered in helping students with special needs in writing is dictation software. While it may have potential benefits, it was not available to use in this study. This software eliminates the need for students to type at all. Students talk into a microphone and their words are typed onto the screen automatically (Raskind & Higgins, 1999; Higgins & Raskind, 2000; DeLaPaz, 1999). Raskind and Higgins (1999) used
pretest, midtest, and postest data to compare an experimental group that used the software and a control group that did not use the software. The experimental group had significant gains over the control group in reading comprehension and spelling. Another study by Raskind and Higgins (1995) investigated the use of the software with college students. They found that essays that students typed with voice recognition were superior to those produced through handwriting or dictation to another person. Dictation software is a more restrictive accommodation and should be considered if the other types of software are not effective in improving writing.

In summary, the research reviewed showed accommodations could help students with special needs succeed in the classroom. These accommodations for writing generally fell under “low tech” or “high tech”. High tech accommodations included computer software. The computer software may be word processors with spell checkers, but those have been shown to have limited success due to the necessity of closely spelling words to their correct spelling. Another type of software that could be used is word prediction programs which predict the word students are trying to type and eliminate some of the opportunity for misspelling to occur. Word prediction programs could also be used in combination with talking word processors, which help by providing audio feedback on what students are typing. Another type of software is dictation software, which works by students talking into a microphone and the computer translates their audio into words on the computer screen.

I found three basic limitations in the research I reviewed. One limitation with the research reviewed on word prediction software was that it included only one to three participants. A second limitation was that all of the research focused on a specific software accommodation, rather than combining software capabilities to get the maximum benefit for the student. Also, these studies were not conducted in classrooms using the Four Blocks literacy framework. Therefore, my research question is “What are the effects of commercial software programs used
as an accommodation for students with special needs in the Writing Block of a Four Blocks classroom?”
CHAPTER III

Methodology

Participants and setting

The participants used in the study were students serviced through both pullout and inclusion. Five students had learning disabilities, one student had a cognitive disability, and one student was in the process of identification for special education. All but one student was African American. Most were eleven years old, but there were two ten year olds. All of these students were participating in the Four Blocks literacy framework. The district the participants attended was moving towards inclusion of more special education students, and this had created a necessity to develop accommodations that assisted students, regardless of their difficulties.

Setting

The setting was an urban elementary school in Southwest Ohio. The district had been searching for ways to help improve its quality of education. One of the four action steps the district developed as part of its improvement plan was to increase the literacy of its students. The district believed that the method with which to do this was the Four Blocks literacy framework. Four Blocks had been implemented district wide in both general and special education classes to create a strong focus on literacy. There were 2.5 hours every school day set aside to focus on literacy.

The school was a technology magnet school that served students in kindergarten through sixth grade. The performance on statewide proficiency testing had been consistently below state standards. The implementation of Four Blocks had led to the beginning of inclusion for students with learning disabilities, and all staff members were required to go to Four Blocks training. The experts who conducted this training were consistently unable to answer questions about how to include students with special needs who cannot read or barely read in the Four Blocks framework.
“What accommodations do I need to make for the students with learning disabilities?” was a common question among general education teachers.

Participants

The participants in this study were served in both a general education fifth grade room and a special education resource room. The resource room served students in second through sixth grade. The teacher in the resource room was in her second year of teaching. There was also a first year tutor who worked in the resource room. The general education fifth grade room contained 24 students. The teacher in that room was in her third year of teaching. She spent her first year working with students with learning disabilities as a tutor.

The student participants of the study were all in the fifth grade. In order to reduce the likelihood of confounding variables, the students selected were all from the same homeroom and were in the resource room at the same time. This would, to the greatest extent possible, reduce the chance that the research would be affected by the students receiving different writing instruction or assistance with writing.

The students in the study were of various disabilities, reading levels, and typing ability.

Bethany. Bethany was an African American female student with learning disabilities. Her primary area in which she struggled was reading comprehension and expressing her thoughts in writing. Her approximate reading level was beginning fourth grade. This was the first year she had received special education services. She was eleven years old. Bethany was comfortable using the computer and could type an assignment of 100 words in fifteen minutes.

Jesse. Jesse was an African American student with learning disabilities, who has received special education services since the first grade. Jesse was retained one time. Jesse struggled with reading comprehension and written expression. His reading level was approximately in the middle of fourth grade. He had a secondary physical disability. He was eleven years old. Jesse
used the computers occasionally for producing final copies of work. He had not had keyboarding instruction, and usually looked at the paper for each word and then typed it.

*David.* David was an eleven-year-old African American male student who was identified with a learning disability one year ago. David was retained in the first grade. His difficulties were in decoding of words, comprehension of what he read, spelling, and written expression. His reading level was approximately late third grade. David occasionally used the computer for producing published copies of writing samples. He generally looked for groupings of words from his rough draft and then typed them.

*Pat.* Pat was an African American male student with learning disabilities who had been receiving services since the first grade. He also repeated the first grade. He struggled with decoding words, reading comprehension, spelling, writing anything longer than three sentences, and answering questions in writing. His reading level was approximately beginning of third grade. Pat used the computer frequently in the resource room for writing last year. He typed by phrases, first looking at his rough draft for the phrases and then typing them from memory.

*Aaron.* Aaron was a ten-year-old African American male student with learning disabilities. He struggled with decoding words, reading comprehension, spelling, writing even one sentence, and answering questions in writing. His reading level was approximately middle of first grade. Aaron struggled with using the computer for writing. When typing writing assignments on the computer, he frequently asked questions and typed by letters. He looked at his paper for each letter, typed that letter, and then looked back to the paper for the next letter.

*Daniel.* Daniel was a male African American student currently undergoing assessment for placement in special education. He was eleven years old. He struggled with decoding, comprehension, spelling, writing, and answering questions in writing. His reading level was approximately end of first grade. Daniel asked to use the computer for writing assignments. He
typed writing assignments by words. He looked on his paper for each word, typed that word, and then moved to the next word.

_Kari._ Kari was a female ten-year-old student with a cognitive disability. She has been in special education for four years. She struggled with reading comprehension, spelling, writing, and answering questions in writing. Her reading level was approximately middle of second grade.

 Obtaining Consent. There were several phases to obtaining consent in order for this study to occur. The first person to give consent for this research study was the principal of the building. This was obtained through a letter that she responded to granting permission (See Appendix A). The second phase of permission was from the district. This was through the superintendent’s designee, who received a summary of this proposal, as well as a letter of consent for appropriate signatures. The third phase of consent came from the parents. They received a letter (See Appendix B) that explained the research study and a space to grant or deny consent for their child to participate. The final step involved the students themselves. They were asked to sign a letter (See Appendix C) giving their consent for their writing to be used. Students were aware that some of their writing would be used for a research study, but they did not know which writing samples would be used. Confidentiality for participants was protected in several ways. The first was by not giving the identification of the school or district. The second was to use fictitious names for the students. When demographic data might cause the identity of the student to be compromised, it was not included in the information on the student.
Design and Data Collection

The design of this study was a case study approach using a modified multiple baseline. This study contained three phases: baseline, intervention using a talking word processor, and intervention using word prediction software in conjunction with a talking word processor. Information about the three phases is given below in Table 1. The baseline phase contained no special accommodations, other than what was typically provided. Baseline data were obtained by collecting six writing samples from each student for two weeks. The baseline writing samples were converted to word processed text to eliminate the possibility of scoring bias towards the essays produced with the software accommodations later. Several research studies have found a scoring bias against essays that were produced by handwriting compared to the same essay when it was word processed (Bridgeman, et al., 1998; Powers, et al., 1994).

Table 1
Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Time period of phase</th>
<th>Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>6 writing samples</td>
<td>No accommodations, students handwrite all their writing.</td>
</tr>
<tr>
<td>Intervention 1</td>
<td>3 weeks</td>
<td>Students use Write Outloud, a talking word processor for all writing</td>
</tr>
<tr>
<td>Intervention 2</td>
<td>3 weeks</td>
<td>Students use CoWriter a word prediction software in conjunction with Write Outloud for all their writing</td>
</tr>
</tbody>
</table>

The second and third phases lasted for three weeks each with a maximum of nine writing samples collected in each phase. The second phase gave students the opportunity to use the “Write Outloud” computer software program, which is a talking word processor with spell checker function. Students were instructed in the use of the software through guided instruction
in the resource room. A projector that links up to a computer was used to show students how to open the software and perform other operations in the software. Students were divided into two groups with only one group receiving instruction at a time so that all students would have access to a computer. Students worked through a mock assignment with the teacher so that they could practice using the software. At the end of instruction, students were given ten minutes to experiment with the software. The next day, students received a brief reminder of how to use the software. Students then used it for their daily free writing in their journals. Students did daily free writing in both the general education classroom and the resource room, so the software was available to use in both the general education classroom and the resource room. Students had the choice to do a new product each day or to work on their product from the day before. Students generally did not spend more than two days on a writing assignment. This allowed two or three writing assignments to be collected for each student per week. After three weeks of using only the talking word processor with spell checker function, the CoWriter word prediction software program was added to the intervention for phase three. The CoWriter software program was used in conjunction with Write Outloud. Students again received guided instruction in the resource room on this new software in the same way as they did with learning the Write Outloud software. They then continued to use the computer in their daily free writing for the three-week period. The baseline and intervention phases were implemented simultaneously for all participants. Hence, the typical multiple baseline across participants design was modified. This modification reduced unnecessary wait time in the introduction of the intervention which could have resulted in withholding an effective intervention. However, this modification could have also made less evident any potential cause-effect relationships that might have existed between the intervention and dependent variables.
Collecting data. There are three basic types of qualitative data that were used to enrich the numerical data. The first was student interviews. These interviews focus on the software itself and to learn how students reacted to the use of the accommodation and if it made it more possible to be independent in assignments. This interview was conducted with a guided questionnaire (See Appendix F). Second, student questionnaires were filled out about the writing (See Appendix E). Students filled out this sheet for every writing sample they produced during the baseline and intervention phases. This gave insight into how students were thinking about their writing, and what they liked or would have changed about it. The third type of supplemental data was teacher notes. These were descriptive notes the homeroom and special education teachers wrote about difficulties with the use of the software or reflections about what students said about the software. It included questions that the students asked about the software. It also included observations about student use of the software, such as writing whether students complained about going to the computer or eagerly went to the computer. This data gave insight that numerical data alone cannot give, such as insight into student motivation to use the software and difficulties with using the software.

The first areas (dependent variables) in which the software accommodation was assessed were quality, quantity, and accuracy. These primarily focused on information gathered from the students’ writing. Information on each writing sample was graphed on a chart. Measures of quality included the score on the district writing rubric (See Appendix D). The writing samples were evaluated based on the district writing rubric by three people: the homeroom teacher, the special education teacher, and an elementary literacy coach. Evaluation by three different people decreased the chance for researcher bias and interrater reliability increased. Measures of quantity included how many words and abbreviations were in the sample. The measure of accuracy included how many words were misspelled in the sample. Then as the software accommodation
was used, the data from those samples was also be charted on a similar graph. This helped indicate whether the accommodation affected the quality, accuracy, and length of the writing.

Data Analysis

Data analysis was done in two ways. The first was to visually analyze graphs in which the measures of quality, quantity and accuracy were recorded. The data recorded here indicated whether improvements occurred and with which accommodation(s). The second way data were analyzed was by reviewing the student interviews to help determine how students reacted to the accommodation software.

The quantitative analysis came from comparing the baseline data to the data collected during the treatment phases, first using the number of words, then the number of misspellings in the writing samples, and finally the rubric scores of the writing samples. Visual analysis was done by using data graphs for each phase to examine levels of change and any trends in the results which may have related to the accommodation.
Chapter IV

Results

The purpose of this study was to determine whether computer software would help students with special needs improve their performance in writing during the Writing Block of Four Blocks. The software used for the study was Write Outloud and CoWriter. The research question that guided this study was, “What are the effects of commercial software programs used as an accommodation for students with special needs in the Writing Block of a Four Blocks classroom?” There were four dependent variables on which the study focused—number of words, number of misspellings, percentage accuracy, and total rubric score.

There were seven participants in the study. The results for each participant, as well as the group averages, are shown in Table 2. There are four figures that show each dependent variable. In Figure 1, the number of words is shown graphically for each student across the three phases, while in Figure 2, a graphic representation of the number of misspellings for each student is shown across the three phases. In Figure 3, the accuracy percentage is shown for each student across the three phases, while Figure 4 shows the Total Rubric score for each student across the three phases.
### Individual and Overall Averages

<table>
<thead>
<tr>
<th>Student</th>
<th>Number of words</th>
<th>Number of misspelling</th>
<th>Accuracy %</th>
<th>Total rubric score</th>
<th>R.S. Punctuation</th>
<th>R.S. Capitalization</th>
<th>RS Sentence structure</th>
<th>Word usage</th>
<th>Spelling</th>
<th>Beginning, end</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline average aaron</td>
<td>28.80</td>
<td>6.60</td>
<td>77.08%</td>
<td>6.04</td>
<td>1.07</td>
<td>1.00</td>
<td>1.10</td>
<td>1.27</td>
<td>1.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline average david</td>
<td>43.80</td>
<td>8.60</td>
<td>80.37%</td>
<td>10.10</td>
<td>1.77</td>
<td>2.37</td>
<td>2.03</td>
<td>1.93</td>
<td>2.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline average daniel</td>
<td>33.00</td>
<td>2.40</td>
<td>92.73%</td>
<td>13.10</td>
<td>3.10</td>
<td>3.23</td>
<td>2.83</td>
<td>1.87</td>
<td>2.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline average jesse</td>
<td>45.60</td>
<td>4.00</td>
<td>91.23%</td>
<td>10.60</td>
<td>2.30</td>
<td>2.70</td>
<td>2.00</td>
<td>1.87</td>
<td>1.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline average pat</td>
<td>38.20</td>
<td>10.40</td>
<td>72.77%</td>
<td>8.00</td>
<td>1.43</td>
<td>1.57</td>
<td>1.60</td>
<td>1.57</td>
<td>1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline average kari</td>
<td>73.80</td>
<td>4.80</td>
<td>93.50%</td>
<td>7.97</td>
<td>1.43</td>
<td>1.17</td>
<td>1.77</td>
<td>1.60</td>
<td>2.00</td>
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</tr>
<tr>
<td>Baseline average bethany</td>
<td>66.20</td>
<td>5.80</td>
<td>91.24%</td>
<td>9.87</td>
<td>1.97</td>
<td>2.13</td>
<td>2.07</td>
<td>1.73</td>
<td>1.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall average overall</td>
<td>47.06</td>
<td>6.09</td>
<td>87.07%</td>
<td>9.38</td>
<td>1.87</td>
<td>2.02</td>
<td>1.91</td>
<td>1.69</td>
<td>1.89</td>
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<tr>
<td>Write Outloud avg aaron</td>
<td>34.71</td>
<td>2.86</td>
<td>91.76%</td>
<td>7.62</td>
<td>1.64</td>
<td>1.31</td>
<td>1.74</td>
<td>1.43</td>
<td>1.50</td>
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</tr>
<tr>
<td>Write Outloud avg david</td>
<td>52.00</td>
<td>4.43</td>
<td>91.48%</td>
<td>8.97</td>
<td>1.64</td>
<td>1.88</td>
<td>1.86</td>
<td>1.88</td>
<td>1.71</td>
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<tr>
<td>Write Outloud avg daniel</td>
<td>42.86</td>
<td>1.00</td>
<td>97.67%</td>
<td>11.75</td>
<td>2.52</td>
<td>2.95</td>
<td>2.33</td>
<td>2.05</td>
<td>1.90</td>
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<tr>
<td>Write Outloud avg jesse</td>
<td>58.14</td>
<td>0.86</td>
<td>98.52%</td>
<td>9.95</td>
<td>2.26</td>
<td>1.43</td>
<td>2.33</td>
<td>2.00</td>
<td>1.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write Outloud avg pat</td>
<td>41.83</td>
<td>3.83</td>
<td>90.84%</td>
<td>9.62</td>
<td>2.17</td>
<td>1.67</td>
<td>2.00</td>
<td>1.95</td>
<td>1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write Outloud avg kari</td>
<td>55.57</td>
<td>2.57</td>
<td>95.38%</td>
<td>8.91</td>
<td>1.81</td>
<td>1.67</td>
<td>1.88</td>
<td>1.67</td>
<td>1.88</td>
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<td></td>
</tr>
<tr>
<td>Write Outloud avg bethany</td>
<td>64.89</td>
<td>1.56</td>
<td>97.60%</td>
<td>12.47</td>
<td>2.81</td>
<td>2.74</td>
<td>2.50</td>
<td>2.21</td>
<td>2.21</td>
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</tr>
<tr>
<td>Overall w.o avg overall</td>
<td>50.00</td>
<td>2.44</td>
<td>95.11%</td>
<td>9.90</td>
<td>2.12</td>
<td>1.95</td>
<td>2.09</td>
<td>1.88</td>
<td>1.85</td>
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</tr>
<tr>
<td>CoWriter average aaron</td>
<td>45.29</td>
<td>3.30</td>
<td>92.71%</td>
<td>9.81</td>
<td>1.95</td>
<td>1.95</td>
<td>1.91</td>
<td>1.95</td>
<td>2.05</td>
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<tr>
<td>CoWriter average david</td>
<td>46.57</td>
<td>2.29</td>
<td>95.08%</td>
<td>10.37</td>
<td>2.25</td>
<td>2.17</td>
<td>2.25</td>
<td>1.79</td>
<td>1.92</td>
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</tr>
<tr>
<td>CoWriter average daniel</td>
<td>53.25</td>
<td>1.13</td>
<td>97.88%</td>
<td>12.21</td>
<td>2.90</td>
<td>3.17</td>
<td>2.38</td>
<td>1.90</td>
<td>1.86</td>
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<td></td>
</tr>
<tr>
<td>CoWriter average jesse</td>
<td>56.29</td>
<td>1.14</td>
<td>97.97%</td>
<td>12.82</td>
<td>3.02</td>
<td>2.71</td>
<td>2.81</td>
<td>2.14</td>
<td>2.14</td>
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<td></td>
</tr>
<tr>
<td>CoWriter average pat</td>
<td>52.00</td>
<td>4.88</td>
<td>90.65%</td>
<td>11.17</td>
<td>2.38</td>
<td>2.17</td>
<td>2.19</td>
<td>2.26</td>
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<tr>
<td>CoWriter average kari</td>
<td>61.14</td>
<td>0.86</td>
<td>98.59%</td>
<td>10.12</td>
<td>2.36</td>
<td>2.48</td>
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<td>1.64</td>
<td>1.89</td>
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<tr>
<td>CoWriter average bethany</td>
<td>51.67</td>
<td>1.14</td>
<td>97.79%</td>
<td>12.24</td>
<td>2.48</td>
<td>2.74</td>
<td>2.50</td>
<td>2.21</td>
<td>2.31</td>
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<td></td>
</tr>
<tr>
<td>Overall Co average overall</td>
<td>52.32</td>
<td>2.10</td>
<td>95.98%</td>
<td>11.25</td>
<td>2.48</td>
<td>2.48</td>
<td>2.26</td>
<td>1.98</td>
<td>2.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RS=rubric score  
WO=Write Outloud  
CO=CoWriter
Group and Individual Performances

Figure 1. Number of words

Number of words. The group average for the number of words in baseline was 47.06 words. This increased to 50.00 words with the use of Write Outloud and to 52.32 words with the use of CoWriter. For five of seven students, the number of words improved from baseline to when CoWriter was used. Among that group of five, there were two students who performed slightly better in Write Outloud than in CoWriter. For two students, the number of words decreased from baseline, regardless of which software was used.
Number of misspellings. The group average for number of misspellings during baseline was 6.09. When Write Outloud was used, this average decreased to 2.44. With the use of CoWriter, the group average for number of misspellings decreased to 2.10. For all seven students, there was a decrease between the number of misspellings made during baseline compared to the number of misspellings made with the use of the Write Outloud software. There was also a decrease for all seven students when the number of misspellings made during baseline was compared to the number made during the use of the CoWriter software. There was a decrease in number of misspellings for three of the students when they used CoWriter as compared to when they used Write Outloud, but the other four students had fewer misspellings when they used Write Outloud rather than CoWriter.
Figure 3. Accuracy Percentage

Accuracy Percentage. Accuracy percentage is the percentage of correctly spelled words. The accuracy percentage average for the entire group during baseline was 87.07% during baseline, with an increase to 95.11% with the use of Write Outloud, and a further increase to 95.98% with the use of CoWriter. For all seven students, there was an increase in accuracy from baseline to when Write Outloud was used as well as an increase in accuracy from baseline to when CoWriter was used. For six students, there was also an increase in accuracy from when Write Outloud was used to when CoWriter was used, but for one student there was a slight decrease in accuracy between these two phases.
**Figure 4. Total Rubric Score**

![Total Rubric Score](image)

*Total Rubric Score.* The average total rubric score during baseline for the group was 9.38 out of a possible 20 points. This score increased to 9.90 with the use of Write Outloud, and increased to 11.25 with the use of CoWriter. For four students, there was an increase in the total rubric score with the use of Write Outloud as compared to baseline, but three students had a decrease in score. There was an increase in total rubric score for six of the students when comparing baseline and CoWriter, but a decrease for one student. When comparing the total rubric score between the use of Write Outloud and CoWriter, there was an increase in the score for six of the students, and a decrease for one of the students.

*Individual Subject Performance*

In Table 2 and Figures 1-4, the data for the individual students are given for the dependent variables, which were number of words, number of misspellings, percentage accuracy, and total rubric score. Those results will be discussed for each student in this section.

*Aaron.* Aaron made improvements in all areas when comparing baseline to the use of both Write Outloud and CoWriter. One way his writing samples improved between baseline and Write
Out loud was in an increase in the number of words. He had an even higher increase in the number of words when he used CoWriter. His number of misspellings decreased with the use of Write Out loud, but increased with the use of CoWriter. His accuracy percentage increased with the use of Write Out loud and increased again with the use of CoWriter. He had the highest rubric score improvement of the group when comparing baseline scores to CoWriter. He went from a 6.04 to a 9.81. CoWriter was the most helpful software for him.

His baseline samples were difficult to decipher. These examples from one of his early baseline samples demonstrate this. The subject for the sample was his fist.

“My fish
My fish is. is Tiley. rist. it hish but it. not Bab it ron. it pass a puch. it hape alate it. cool.”

Aaron read the above sample as the following: “My fist is tell fist. It huge but it not bad. It run. It pass a punch. It help a lot. It cool.”

A sample using CoWriter, in which he wrote about walkie talkies, demonstrated how much easier to read was the sample.

“What ime going to do with my walkie-talkies. I’m going to give my grandma one. And I can call her. And she will not be alone. she is in trouble so she can call me. So we are can talk. And we and my grandpa can talk. And my cousin can talk to.”

When asked to evaluate his baseline writing samples, Aaron consistently said, “I wish I could spell better” and “I should have done better on the words.” When asked to evaluate his samples produced with CoWriter, Aaron said, “I like how I spelled my words.” The CoWriter software helped Aaron improve his writing in all areas considered.

David. David made improvements in all four areas when baseline was compared to CoWriter. His number of words increased from baseline to when he used Write Out loud, but decreased between Write Out loud and CoWriter. However the number of words when he used
CoWriter was still more than during baseline. His number of misspellings decreased from baseline to when he used Write Outloud, and further decreased with the use of CoWriter. This was the most important improvement the software helped him to make. His number of misspellings went down from 8.6 during baseline to 2.3 with the use of CoWriter. His percentage accuracy increased from baseline to Write Outloud, and increased even more with the use of CoWriter. His total rubric score increased slightly from baseline to when he used CoWriter. He had a decrease in total rubric score between baseline and Write Outloud, but he had improvements in the areas of number of words, number of misspellings, and percentage accuracy between baseline and when he used Write Outloud. David made improvement in the areas of number of words, number of misspellings, percentage accuracy, and total rubric score between baseline and when he used CoWriter. Overall, the CoWriter software was most effective for David.

Daniel. Daniel showed improvement in the areas of number of words, number of misspellings, and percentage accuracy while using both software titles. From baseline to Write Outloud, Daniel had an increase in the number of words from 33 to 42. This further increased to 53 with the use of CoWriter. For Daniel, this was the most significant change. His number of misspellings decreased from baseline to the use of Write Outloud, but then had a slight increase between the use of Write Outloud and CoWriter. Daniel showed improvement in percentage accuracy from during baseline to when using Write Outloud and CoWriter. The area that Daniel did not show improvement in when using the software was total rubric score. In fact his rubric scores decreased by almost one point when baseline and CoWriter scores were compared. One possible explanation for this occurrence is that the software is most helpful in improving spelling, capitalization, and punctuation. Daniel had strong rubric scores in this during baseline, so the software would have been less helpful in improving his writing. However, the software was
helpful in increasing the number of words, the number of misspellings, and percentage accuracy.

Overall Cowriter was more effective for Daniel than Write Outloud.

*Jesse.* Jesse showed improvement in all four areas when using Write Outloud and CoWriter. The average number of words Jesse wrote during baseline increased by 13 when using Write Outloud, and then made a slight decrease of two words between Write Outloud and CoWriter. The number of misspellings Jesse had during baseline, decreased with the use of Write Outloud, but there was a slight increase between Write Outloud and CoWriter. His percentage accuracy increased between baseline and when he used Write Outloud, but his CoWriter accuracy was slightly lower than when he used Write Outloud. His total rubric score during baseline decreased slightly when he used Write Outloud, but increased when using CoWriter. Write Outloud seemed to be more beneficial to Jesse than CoWriter. This suggestion is evident in that Jesse had higher scores in three of the areas in Write Outloud in comparison to CoWriter.

*Pat.* Pat showed great improvement when using the software in all four areas. He had the highest increase in percentage accuracy for the group when comparing baseline and the use of CoWriter. It went from from 72.77% to 90.65%. He also had the biggest decrease in the number of misspellings when comparing baseline and the use of CoWriter. That score went from 10.40 during baseline to 4.86 with the use of CoWriter. The average number of words Pat produced in his baseline samples increased when using Write Outloud, and further increased when using CoWriter. His total rubric score also increased by 1.6 points when he used Write Outloud as compared to baseline. His score further improved by 1.5 points between the use of Write Outloud and CoWriter. Pat is another student who it was helpful to look at his baseline writings which were difficult to read and then look at his writings produced with CoWriter.
Here is one of his baseline samples.

“I will play with my renocerral car and corg it and play my gam and my friend.”

Here follows one of his CoWriter samples.

“If there were no grown ups on the world. I will get all the dirt bikes. And for whalers I will have so much fun with my cousin…”

Pat made improvement in all areas when using the CoWriter software as compared to baseline. CoWriter was more effective than Write Outloud in helping Pat. These areas were number of words, number of misspellings, percentage accuracy, and total rubric score.

Kari. Kari made improvement in three areas when comparing baseline to when using CoWriter. These areas were number of misspellings, percentage accuracy, and total rubric score. The number of misspellings Kari made decreased by two from baseline to when using Write Outloud and further decreased when using CoWriter for a total improvement of almost four fewer words misspelled. Her percentage accuracy improved from baseline to when using Write Outloud and further improved when using CoWriter. The most significant improvement Kari had was in the total rubric score. Kari’s rubric score increased from 7.97 during baseline to 8.91 with the use of Write Outloud, and it further increased to 10.12 with the use of CoWriter.

The only area that Kari showed no improvement in with the use of the software was the number of words. Kari had an average of 73.80 words during baseline. This decreased to 55.57 with the use of Write Outloud and then went to 61.14 with the use of CoWriter. While this appears to be negative for Kari, the researcher perceived that it actually was beneficial. Kari tended to repeat herself in her baseline writing samples which inflated her number of words score. She did not do this as much when using CoWriter.

An example from part of a baseline sample exemplifies this.
“I love my family very much and I Love Love my family very much and we is very nice to me and I like my Family very much and we is very nice to people and we Love each other and we Love each other and we is very nice to each other and we is very nice and I love my family much and I Love them...”

A sample produced with CoWriter follows for comparison.

“When I grow up I will be a teacher I will be a good teacher. And I will be very happy and teach in Carlson. I went to teach reading to the smart kids. I like to read and I like to read very much. I like do math to and I will teach them math.”

While the sample produced with CoWriter has some repetitive words and phrases, it is not to the extent that occurred in baseline. One reason Kari’s rubric scores may have improved was because she covered the topics more thoroughly and refrained from repeating the same idea over and over. This is the main reason why I believe a decrease in words was a positive occurrence for her. Overall, CoWriter was the more effective software for Kari.

Bethany. Bethany showed improvements in three areas when using the software. These areas were number of misspellings, accuracy percentage, and total rubric score. Bethany had a decrease in the number of misspellings from baseline to Write Outloud. It further dropped between the use of Write Outloud and CoWriter for a total drop of more than four. Bethany also had an improvement in percentage accuracy between both the use of baseline to Write Outloud and Write Outloud to CoWriter. The area that Bethany made the most improvement in was total rubric score. Bethany’s total rubric score during baseline was 9.87. This increased to 12.47 with the use of Write Outloud, but dropped slightly to 12.24 when using CoWriter. The area that she did not show improvement in when using the software was number of words. Her number of words dropped by almost one and a half words between baseline and Write Outloud. It dropped by more than 13 words between the use of Write Outloud and CoWriter, which was equal to a
decrease of nearly 15 words between baseline and CoWriter. The software was beneficial to Bethany in the areas of misspellings, accuracy, and rubric score, but had a negative impact on the number of words Bethany wrote. One possible reason for the decrease in number of words was that when using the computer, Bethany and her teachers both observed that it took her longer to complete writing assignments. She may have started writing fewer words, so that she could get her writing assignments completed. Looking at the numbers alone, it is difficult to determine which software was more effective for Brittany. Number of words and rubric score were higher when using Write Outloud, but number of misspellings and percentage accuracy were more improved with CoWriter.

Qualitative Results

There were three primary ways in which qualitative data were collected. These were an interview with the coteacher, interviews with students, and field notes. The coteacher and student interviews will be discussed here, while research notes will be included in Chapter V in the Discussion.

CoTeacher Interview

A personal interview was conducted with the Fifth grade homeroom teacher, Mrs. Henry on March 11, 2004 and continued on March 25, 2004 over the phone. This was an unstructured interview. Mrs. Henry was asked what she thought about the students’ baseline writing samples. Some specific questions asked were “What were the challenges with grading the student’s writing?” “What were difficulties encountered when the students produced these during the Writing Block?” She stated that some of them were very difficult to read and that she faced the difficulty of deciphering their writing every day. When asked about Write Outloud, Mrs. Henry responded positively and stated that “Write Outloud is easy to use and is more helpful than just using a word processor”. She also said that she had her whole class use it while preparing Black
History Month papers. She thought it was helpful in both spelling and sentence construction because of the audio feedback. She had observed students changing the wording of sentences to make them sound better after listening to the audio feedback. The one thing she did not like was that with some printers, the font had to be changed manually for it to print out in a readable format.

Mrs. Henry thought that the CoWriter software was helpful for some students, especially those who have severe writing problems. She noticed that some of the students wrote less when they used CoWriter. She stated that many of the students using the software had difficulty opening it and she frequently had to help students. She also said several students lost writings by not properly opening the software. She said these problems decreased after they had become more familiar with the software.

Overall, Mrs. Henry stated that the writing software helped her students produce better writing samples, although it was difficult to have seven children using writing software with only four computers in the classroom. She also stated that students who had fewer problems with written expression should use it to produce final copies, while those with severe problems should use it for all steps of the writing process. She identified three of the seven children that she thought needed the software the most—Pat, Kari, and Aaron and felt that having it as an accommodation for fewer students or having more computers would make it more manageable. Mrs. Henry stated she was willing for the students to continue using the software as needed.

**Student Interviews**

The students participated in structured interviews that contained four areas in which they rated the software, comments about why they gave the software that rating, and three open ended questions to which students responded. The students had a choice of giving it a score of 1-5 with
I being unacceptable and 5 being excellent. The ratings that each student gave the software are included below in Table 3.

Table 3

*Student Ratings of Software*

<table>
<thead>
<tr>
<th>Software</th>
<th>Student</th>
<th>Easy to use</th>
<th>Fun</th>
<th>Keep My interest over time</th>
<th>learned from it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write Outloud</td>
<td>Aaron</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>David</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>Daniel</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>Jesse</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>Pat</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>Kari</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Write Outloud</td>
<td>Brittany</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Totals Write Outloud</td>
<td></td>
<td>4.57</td>
<td>4</td>
<td>3.86</td>
<td>4.29</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Aaron</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Cowriter</td>
<td>David</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Daniel</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Jesse</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Pat</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Kari</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Cowriter</td>
<td>Brittany</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Totals Cowriter</td>
<td></td>
<td>4.14</td>
<td>4.43</td>
<td>4.57</td>
<td>4.71</td>
</tr>
</tbody>
</table>

There were some effects that all students thought were positive for the software. They all said that they liked Write Outloud saying the words to them. They also agreed that CoWriter was most helpful in spelling. This software helped them spell better, because they could see the word on the list and then spell it correctly. All of the students also expressed that they liked to use the software and wanted to keep using it as much as they could. Other important statements that individual students made will be discussed next.
Aaron. Aaron made several insightful comments about the software in his interview. He said, “Write Outloud helps me know where to put periods and spaces, because I have to put periods in order for the software to say my sentence.” He also said that the best thing about Write Outloud was its built-in dictionary. Aaron said he liked being able to look up the definition of the word right on the computer. When asked about CoWriter Aaron said, “CoWriter is great and it is helping me to become a better reader.” When asked to explain what he meant, he said that he could guess the beginning sounds of a word and type it, and then it would show up on the list. If it did not come on the list, then he had to sound it out again and retype it. If it came on the list, then he could click on it and it would go into his writing. He said that he would know how the word started the next time he needed to type it and then when he saw the word later in a book, he could usually remember the word.

David. David said he liked Write Outloud the best. He said he liked how it sometimes said words “funny”. He liked CoWriter too, but sometimes he did not like having to look at the list of words.

Daniel. Daniel said he liked how Write Outloud makes a noise that tells you that a word is spelled wrong. He got upset when the misspelled word he wanted to type did not show up in spell check. Daniel said, “I would use it the rest of my life if I could.” He also said that he thought his writing was better with CoWriter. He said, “It is neater and I can read it better.”

Jesse. Jesse said he liked the “funny voice” that the computer used in Write Outloud. He also said that he liked that Write Outloud had a dictionary where you could look up words on the computer, but said that CoWriter would be better if it took up the whole screen instead of only part of the screen. He said CoWriter helped because when he needed to type the big word motorcycle, all he had to do was put in “mo” and motorcycle came up on the list. Jesse also said if his friends used CoWriter then they would become better readers.
Pat. Pat said that Write Outloud helped him because if a word was spelled incorrectly, it would say the word incorrectly when it read it. Pat said that he liked CoWriter because he did not have to keep erasing over and over as he did when he wrote on paper. He also said he had learned to type a different letter if the word did not show up on the list; then it usually would show up on a list. Pat said that CoWriter helped him learn faster and better and that he liked it a lot. He said, “it makes me want to be a computer fixer or something like that.”

Kari. Kari said that she really did not like Write Outloud because you had to do so much typing. Kari liked the fact that CoWriter gave you the words at the bottom and said it was fun to use.

Bethany. Bethany said, “I like Write Outloud, because it notifies you when you spell words right or wrong.” She also said that it helped her read new words by saying the words on the computer. Bethany said that sometimes CoWriter takes a long time for big words to show up on the screen. She also said that CoWriter was fun, but that she really did not think that it helped her write better.

Summary

The teacher and students gave helpful insight into the use of the software. This information was acquired during interviews. The teachers and students gave positive comments about both the Write Outloud and CoWriter software. Further discussion of these results, as well as researcher field notes will be discussed in Chapter V.
Chapter V

Discussion

This study focused on the effects of writing software being used by students with disabilities during the Writing Block of Four Blocks. The software used was Write Outloud alone and CoWriter in conjunction with Write Outloud. The students were doing free writing during all phases of the study. Data were gathered for a set number of samples for baseline and for three weeks for each of the two phases using the software programs. There were seven student participants, who were all in the fifth grade.

Limitations of the study

This study is limited in several ways. The primary issue is the small number of students involved in the study. This limits the generalizability of the results. Another way that the study is limited is that it only involved two types of software. There is a great variety of software available, some of which may have been even more beneficial. Another issue relating to generalizability is that most of the students were students with learning disabilities. This raises the question of whether the same results would occur if the subjects were primarily students with other disabilities.

The question guiding this study was, “What are the effects when writing software is used by students with disabilities during the Writing Block of Four Blocks?” The question was answered in this study. In general, the effects of using writing software during the Writing Block were positive for most students, although there was one student, Daniel, whose rubric score decreased. Looking back at researcher notes, Daniel was found to be without his headphones on three different occasions, which would prevent him from the benefit of audio feedback of his writing. This may partially explain why his rubric scores deteriorated when using Write Outloud. He also had to be reminded several times to utilize the word list in CoWriter. Daniel said at one
point that, “I do not want to use the list, I just want to type.” He was also found closing out CoWriter and using Write Outloud without CoWriter. Daniel said, “I want to get done faster, and CoWriter takes me longer than Write Outloud.

David struggled to use the word list in CoWriter. His rubric scores improved slightly from a baseline score of 10.10 to 10.37 when using CoWriter. Initially, David was not watching the list at all and was observed typing words that appeared on the list several letters before he would see it. David stated when he first started using CoWriter that he did not like watching the list.

Bethany was already a relatively strong writer when this study began. She showed improvement in two areas between baseline and Write Outloud. Her Write Outloud scores were higher than her CoWriter scores in all but one area. Researcher notes listed several positive comments Brittany made while using Write Outloud, such as, “I like typing with this software” “This software helps me spell words right” and “This is fun, typing on this program. Can I type 2 stories today?” With CoWriter, Bethany was still motivated, but she spent less time typing. She also said that she did not like CoWriter, because it was hard to look at the list when she already knew how to spell most of the words. The researcher believes that Write Outloud was an extensive enough accommodation for Bethany and would recommend that she use that, rather than CoWriter. This belief is supported by her higher scores when using Write Outloud as compared to CoWriter.

Aaron stated that writing was difficult during baseline. He struggled to spell simple words and often asked the teacher to sound out words so he could write the sounds. Researcher notes indicate that Aaron independently discovered the dictionary function of Write Outloud and showed other students how to look up a word in the dictionary. One day, when other activities had to be done in the resource room, Aaron said he was sad that they would not be able to write on the computer. For Aaron, the software helped him express himself in writing, without the
major difficulties he encountered during baseline. His text produced using CoWriter was easier for others to read because of reduced spelling errors and better sentence structure.

The writing software helped all of the students in at least one area. For four of the students, it helped improve all four areas—number of words, number of misspellings, percentage accuracy, and total rubric score. Beyond what the numerical results suggest, the students seemed excited about using the software, and as a result were excited about writing. These are the same students who had blank notebooks after five days of free writing prior to the implementation of the study. All students said at some point throughout the study that they liked to use the computer for writing. If for some reason they were not able to get on the computer, then they would ask if they were going to be on the computers the next day.

*Implications for Instruction*

I learned from this study that students with disabilities can be effectively included in the Writing Block. It may entail a combination of low tech or high tech accommodations; and commercial software is one consideration. However, the software used should be based on the student’s needs. One software program may be more effective for a student than for other students and some students may do better in some areas without software. That is why when writing an Individualized Education Program, we should consider assistive technology.

Students should also be consulted to determine what they need. Students were generally able to identify how their writing was deficient. For example, several students identified spelling or the need to write more words as problems during baseline. After using a software program, students can tell you what they liked or did not like about it. The students that did not prefer Write Outloud did better with CoWriter. They were able to identify what was helpful about the software and what they learned from it. This type of information should be considered in future
planning for these students. If the students are part of the decision making about the software, than they may become more engaged in the writing process.

Software can be used as a general education classroom accommodation although issues may emerge. Timing and space problems would need to be resolved. With good teacher collaboration, I will use it as an accommodation for students in the future. The cooperative environment between the resource room and general education classroom helped make the software use successful. Disks of students’ writings were carried back and forth between classes. Scheduling was flexible enough to allow students to finish typing what they started before transitioning to a new activity.

Teachers in the classroom should consider these suggestions as well as how students will print out their writings. Teachers may first want to select the students with the most severe writing disabilities to help address the issues of timing and space if computer access is limited.

**Implications for Research**

Several areas should be considered regarding the future of research on the use of writing software for students with disabilities. There may be features of the software that may make it difficult for some students to use. For example, students found CoWriter difficult to open, but with practice some of these issues were resolved.

I found student comments and interviews helpful. It helped to explain some of the reasons why the numerical data varied among students. The rubrics were somewhat difficult to use, but they provided a measure of quality that simple word counts and misspelling counts could not provide.

Future research could include dictation software to determine if it further improves student writings. Also one might focus on teacher attitudes toward the software used as an accommodation. Another focus could be to investigate if similar improvements occurred with
different students or a larger group of students using the same software programs. Another focus could be if similar improvements occurred with different students or a larger group of students.

This study focused on the use of computer software with students with special needs. In general, it was found to have a positive effect on writing and students were motivated to use the software. The homeroom teacher continues to be open to the use of software as an accommodation. For at least two of the students, it will be written into their IEP as an assistive technology accommodation for all subjects.
References


CoWriter software. Don Johnston.


Write Outloud software. Don Johnston.
Appendix A
Letter to Principal

Dear Mrs. Barnes,

I am currently working on a master’s degree at the University of Dayton in the Department of Teacher Education. As part of my requirements for this program, I am completing a research study. I have chosen to research the effectiveness of using commercial software as an accommodation to help students with special needs in the Writing Block of Four Blocks.

When the district implemented Four Blocks last year, I saw my students struggle to produce writing samples during the Writing Block. Many students told me they felt like their writing was too short and too babyish to share. I saw them struggle with spelling, with word usage because of their limited spelling, and difficulty completing work in a timely fashion. I saw many students give up on a piece, because they were having so many problems. I see the same issues in my students this year.

I will be trying two district approved software packages to see if it will help my students to more effectively participate in the Writing Block. The software packages I will be utilizing are Write OutLoud which is a talking word processor and CoWriter which is a word prediction software programs.

I will collect student writing for around nine weeks. I will evaluate the effectiveness of the software in helping students in their writing in three ways: 1. Number of words; 2. Number of misspellings; 3. Score on a writing rubric. The writing rubric is derived from the Ohio Department of Education’s Fourth Grade Writing Rubric. I will compare data from student writing with no accommodations to the data from when students were using the software.

Before I can begin my study, I need to obtain permission from you and the district, and the parents of my students, as well as the students themselves. I would like this study to take place during the months of December to the end of the third quarter. The final results of the study will be made available to you.

If you have any questions about my study, I can answer them in person or you can contact me at 542-4303 or by email jcullen@dps.k12.oh.us.

Sincerely,

Jennifer Cullen
Intervention Specialist

ENCL: Sample Parent Permission Letter
Appendix B
Letter to Parents

November, 2003

Dear Parents,

As a graduate student at the University of Dayton, I am completing a research study as part of my requirements. My graduate work has been in the field of special education. I have chosen to research using software to help students with writing.

As part of your child’s daily activities at school, they do freewriting. This is where students write about what they choose for a certain amount of time, usually around 20 minutes. I will be collecting these writing samples for about nine weeks. During the first few weeks students will do this just by handwriting their writing as they have always done. For three weeks they will use a word processor that says the words out loud as students type them. During the last three weeks, students will use the talking word processor with another software that helps students by guessing the word they are trying to type. There will not be any extra work for your child. It is all things that they do everyday, but they will have the opportunity to use the computer for writing. Your student’s name will be removed from the writing, so that I am the only one who knows which child did the writing. The results of the study will be made available to the school as they become available.

Prior to asking for your consent, I obtained consent from the principal and from the district. In order for my research to proceed, I need to have your permission for your child to participate. Please sign the bottom of this page and have your child return it to me by November. If you have any questions or concerns about this research study, please call me at 542-4303 (work) or 235-0516 (home).

Thank you,

Jennifer Cullen
Resource Room teacher

______________________________ has my permission to participate in Ms. Cullen’s research study.

Student name

Parent signature ______________________________
Appendix C
Letter to Students

November 2003

Dear __________________________,

Did you know that I go to school too? I go to the University of Dayton. Just like I give you work to do, I also get work to do. One of the big assignments I have to do is to do a research study where I try to find something that will help my students in their work. I want to have you try using the computer for your writing and see if it helps you.

I already asked the principal and your parents if you could help me with my work and they all said yes. I want you to know what I want to do and if you want to help me, that will be great. I will collect your writing that you do in both of your classrooms and make copies of some of it. As we use the computers, I will print off some of your writing from there. I will not tell you which writing assignments I copied, you will just know that I copied some of them.

Please sign your name at the bottom if you want to help me with my work by letting me copy your writing. You will get the chance to tell me if you like using the computer for writing and you will get the chance to decide how you feel about your writing.

Thank you,

Ms Cullen

________________________________________
I give Ms Cullen permission to use my writing for her research study

________________________________________
Student signature
**Appendix D**  
**Writing Rubric**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Punctuation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has frequent and blatant errors in basic punctuation</td>
<td>Shows knowledge of the conventions of punctuation.</td>
<td>May have occasional punctuation errors that do not interfere with the message</td>
<td>Contains correct end punctuation</td>
<td></td>
</tr>
<tr>
<td><strong>Capitalization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has frequent and blatant errors in capitalization at the beginning of sentences and for proper nouns</td>
<td>Shows knowledge of capitalization at the beginning of sentences and for proper nouns</td>
<td>Has correct capitalization at the beginning of sentences and for proper nouns</td>
<td>Exhibits the use of capital letters at the beginning of sentences and for proper nouns</td>
<td></td>
</tr>
<tr>
<td><strong>Sentence structure, word usage, and spelling</strong></td>
<td>Uses limited or inappropriate vocabulary that obscures meaning and has gross errors in sentence structure, word usage, and spelling that impede communication</td>
<td>Uses limited vocabulary and has word usage and spelling errors that interfere with the message</td>
<td>May have occasional word usage and spelling errors that do not interfere with message</td>
<td>Shows an awareness of word usage and spelling patterns in commonly used words and uses a variety of words</td>
</tr>
<tr>
<td><strong>Beginning, middle, and end</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhibits little or no evidence of an organizational structure; the beginning middle or end of the response may be poorly defined or nonexistent</td>
<td>Shows an attempt at organizing the paper around a beginning, middle, and end</td>
<td>Has a logical order with an apparent beginning, middle, and end, although some lapses may occur</td>
<td>Has a logical structure that flows naturally with a beginning, middle, and end</td>
<td></td>
</tr>
<tr>
<td><strong>Topic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offers few details and topic of their writing is not clear</td>
<td>Attempts to follow a topic and has some supporting details, but may include extraneous or loosely related material</td>
<td>Has a topic that it generally addresses and contains adequate supporting details</td>
<td>Focuses on the topic, clearly addresses the topic, has ample supporting details</td>
<td></td>
</tr>
</tbody>
</table>

Table format based on writing rubric at [www.teach-nology.com/cgi-bin/writing.cgi](http://www.teach-nology.com/cgi-bin/writing.cgi)

Criteria derived from Ohio Department of Education 4th grade Writing rubric
Appendix E
Student Writing Reflection

1. What was your topic for this piece of writing?

2. How do you feel about this piece of writing?

3. What do you like about it?

4. What do you think you could have done better?
Appendix F
Software Evaluation

Conducted verbally
Name of software ________________________________

SuperKids Kid’s Product Evaluation
(5 = excellent, 4 = good, 3 = OK, 2 = weak, 1 = unacceptable)

Is this software easy to use?

5 4 3 2 1
Comments?

Is it fun?

5 4 3 2 1
Why or why not?

Will it keep your interest over time?

5 4 3 2 1
Comments?

What have you learned from this software?

5 4 3 2 1

What did you like best? least?

Would you recommend it to your friends?

Kids review (1 - 2 paragraphs):