

The Impact of Computer Use on Middle School Student Writing

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## **Abstract**

The purpose of this study was to determine whether middle school students' writing would improve with computer use. A teacher-devised writing rubric was used to measure the writing outcome. There was one group of students that took two posttests within a six-week period. The first posttest was a descriptive writing essay that required students to write three paragraphs using a pen and paper. The second posttest was a descriptive writing essay with a similar prompt that required the students to use a computer to respond. There was no statistically significant difference in the means of the achievement scores. Thus, the null hypothesis was retained. Future research should continue as technology is increasingly becoming present in classrooms and it is critical to be able to measure its effectiveness. Studies that include different types of writing software and more diverse subjects are suggested.

# **CHAPTER I**

## **INTRODUCTION**

### **Overview**

Technology is commonly found in today's classrooms. Teachers and students use varied forms of technology to facilitate learning and presentations. A typical form of technological equipment present in teaching spaces is the laptop computer. Though use of the computer may be varied, students often use the laptop computer and associated application software to produce drafts of writing. There are classrooms that have moved from transcription with pen and paper to the computer keyboard. There are prevalent assumptions that students who use computers to write will yield higher quality results when compared to students who use pen and paper. However, conclusive research to support this assumption is lacking.

The researcher's experience teaching writing to middle school students involved the consistent use of computers and accompanying word processing software. Though the researcher witnessed significant success in the cultivation of writers, she noticed that some students' writing output was more favorable when the students did not employ the laptop computer. With the prevalence of computer laptops in the classrooms, the need to formally assess the efficacy of using laptop computers for writing needs to be addressed.

### **Statement of Problem**

Does the use of computers impact the quality of writing of middle school students? The researcher designed a study to compare assessments of middle school students' essays written with a computer with those that were transcribed with a pen and paper.

### **Hypothesis**

The null hypothesis proposes that the writing of middle school students who use the computer to write will not be significantly different than that of middle school students who don't use the computer to write.

### **Operational Definitions**

The dependent variable is the writing quality, assessed using a rubric, with weights assigned to writing content, mechanics, and specific criteria for the assignment. The independent variable is the use or nonuse of the computer. The computers were laptop computers. The word processing software used was Microsoft Word.

## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

#### **Introduction**

Traditional methods of education are changing due to the influx of technology into the classrooms. Though schools in the United States have been incorporating technology for over 25 years, this does not ensure improved educational outcomes (Arneson, 2014; Soobin, Warschauer, & Binbin, 2016). Recent research is inconclusive about the impact of technology on academic achievement (Andrews, Freeman, Hou, McGuinn, Robinson, & Zhu, 2007; Fitzpatrick, Vander Hart, & Cortesa, 2013). Factors complicating research include the lack of a uniform definition of technology, the many subject areas that are affected by its use, varying degrees of teachers' usage of and comfort with technology, and varying resource availability (Bebell, O'Dwyer, Russell, & Hoffmann, 2010; Cottrell, 2016; Soobin et al., 2016).

This literature review focuses on the research regarding the use of laptop computers to support writing composition in the classroom. The first section is devoted to the definition of technology in this review. The second section is devoted to the negative impact of computer use. The third section is devoted to the positive aspects of computer use; the fourth is devoted to impediments to the implementation of technology, along with solutions. Finally, the fifth section summarizes the need for further research to determine best practices in using technology to augment writing instruction.

#### **Contextual Meaning of Technology**

Technology that is used in the classroom needs to be defined. There are different types of computers found in classrooms today. There are desktop computers, laptops, and tablets or iPads. The question of whether the type of computer used in the classroom has an effect on the results



of the study arises. The issue of applying data from studies that use different types of computer equipment is relevant. In particular, the question of whether the type of technology impacts essay writing needs to be addressed.

The laptop computer is more portable than the desktop computer, making it an ideal choice for sharing among classrooms and workspaces. Laptops may sit on students' desks, without the need for computer tables and designated computer laboratories. When not in use or when being moved, laptops may be stored easily in charging carts, which require minimal storage space. Also, security measures to store the costly equipment are much easier to implement. Desktop computers require permanent stations, necessitating increased space in the classrooms or dedicated computer labs to house them. If there are computer labs, there is the need for increased personnel to staff the labs. Often, since there is more scheduling and planning involved when taking trips to the laboratory, teachers forgo the opportunity to use the computers.

However, desktop computers typically are sturdier and more robust options for active students. Also, repairs and replacement parts are less expensive than for laptop computers. The actual appearance of the computers creates different experiences for the users. Laptop computers typically have smaller screens and more compact keyboards than desktop computers. They have touch pads and pointing devices that require fine motor coordination to use. An external mouse and/or keyboard may be attached; however, this decreases the laptops' ease of storage and mobility. Though studies over two decades ago pointed to decreased performance during writing assessment when using a laptop, more recent studies show that performance during written essay exams is not different. This may be due to laptop's evolving into a more versatile machine. Or students' increased regular exposure to technology may boost their adeptness with the equipment (Ling & Bridgeman, 2013).

The tablet, or iPad, is smaller yet. The iPad is extremely versatile. With increased mobility, a long lasting battery, and features that offer ease of use, the iPad may be an ideal tool for the classroom (Ling, 2016). No cables, cords, or power supplies need to be present as the batteries have a six-hour charge. However, the iPad's accompanying virtual keyboard is significantly sligher than its laptop or desktop counterpart, causing typing errors to occur with greater frequency. Even if an external keyboard is used, it is still significantly smaller than the keyboard of laptop or desktop. Also, entering non alphabetic symbols requires consistently reconfiguring the keyboard (Ling, 2016).

Despite the constrictions of using the tablet, studies indicate that writing test results are comparable. Essay length, speed of writing, and essay scores were used to measure results. However, the studies qualify that the students must be experienced with the iPad and the computer. Six months of exposure to the equipment constitutes experience. Additionally, the study notes that similar numbers of students prefer the iPad and the computer (Ling, 2016).

Based on the above findings, research involving laptops, computers, and tablets is considered pertinent in the review of the pros and cons of computer usage in the classroom. The need to consider the specific computer type is deemed unnecessary in lieu of the above findings.

### **Negative Impact of Technology on Writing**

Text transcription is a critical component of the writing process and influences its outcomes. Text transcription includes but is not limited to spelling, keyboarding, and handwriting (Troia & Olinghouse, 2013). One negative impact of using laptops to compose is the effect of the diminished use of handwriting. Studies that compare student writing with laptops versus handwriting distinguish between the individual character, the sentence, and the essay. At the character or letter level, the rate of production is quicker via the keyboard than a pen, while at

the sentence level, fourth- and sixth-grade students have been found to compose sentences that are more complete using a pen as opposed to a keyboard. Both learning disabled and non-learning disabled students in fourth through sixth grades were found to consistently write longer essays in shorter time periods using a pen versus a computer. In terms of content, students generated more ideas in an essay when using a pen as well (Berninger, Abbott, Augsburger, & Garcia, 2009). This could be attributed to the unique brain engagement that takes place during handwriting that may not occur during keyboarding (McDaniel, 2014). The tactility of forming letters may activate portions of the brain that actually help composition. In fact, increased fluency in handwriting is related to corresponding increases in variety of utilized vocabulary, quality of writing, prewriting organization, and basic knowledge of writing (Fitzpatrick et al., 2013).

Furthermore, as preparation for college includes the ability to write essays on timed tests, it may be problematic that students who are only used to keyboarding are limited in their performance on such tasks (McDaniel, 2014). Hand writing essays under time constraints is required on the SAT and ACT, as well as with other standardized testing (Fitzpatrick et al., 2013). Additionally, the tactility of handwriting leads to increased memory of what one is writing, making it the ideal method of transcription for college note-taking (McDaniel, 2014).

Aside from a reduced focus on handwriting, keyboarding presents many concerns in and of itself. Inadequate typing skills impede the fluid use and mechanics of keyboarding. Some students are distracted by choices of fonts and text sizes and thus waste writing time modifying the appearance versus the content of their document. Additionally, fine motor coordination is necessary for using the trackpad on a laptop, which often poses difficulty for students (Kemker, Barron, & Harnes, 2007).

When students use technology to write, they may also begin to rely on the technology to automatically correct their mistakes. When learning disabled students use the spell checking features, they do not distinguish between the meanings of homophones and may choose words that are not correct (Eden, Shamir, & Fershtman, 2011).

### **Positive impact of Technology on Writing**

Despite the concerns noted above, many studies have revealed positive writing outcomes associated with computer use (Penuel, 2006; Donovan, Hartley, & Strudler, 2007). Cotrell (2016) notes that the use of a computer is associated with students giving more thought to content. The writing experience has a more definitive structure with the use of a computer than with the use of a pen and paper. Additionally, the use of technology is considered to be motivating (Kemker et al., 2007). Increased motivation may yield improved writing outcomes (Troia & Olinghouse, 2013).

Researchers suggest that keyboarding frees up working memory for higher level processing. In focusing on writing and spelling, young writers do not need to concentrate on the physical act of writing (Berninger et al., 2009). Additionally, when students use computers to create their compositions, they seem to increase their self-esteem as authors and writers. Overall improved performance is noted when students are assigned laptops. Though more research is needed and the various studies concentrate on different aspects of writing, organization, style, length, attitude, convention, and voice are some attributes of writing noted to improve when technology is incorporated. Additionally, grammar and spelling were found to be improved with the use of word processing software (Andrews et al., 2007).

Since new standards mandate students' knowledge of technology to write, and since testing is frequently conducted using a keyboard, it is critical that students use computers to write

during lessons (Evmenova et al., 2016). Word processing software is shown to help learning disabled children with dysgraphia, dyslexia, and other handwriting issues (Eden et al., 2011). The need to pay attention to each letter promotes increased attention to spelling and improved skills. The spell checking, dictionary, and thesaurus make a word processor a useful choice for improving these skills and addressing contemporary demands for students to be competent users of laptops and technology (Vue et al., 2016).

### **Impediments to Implementation of Technology**

Some impediments to the implementation of technology into writing instruction have been identified. Researchers note that teachers are a critical component of the process (Donovan et al., 2007) Technology is not an independent means to ensure writing improvement but rather needs to be supported by effective teaching strategies. To successfully empower teachers, professional development needs to address their technology-related skills, concerns, and needs. Addressing teacher concerns about using technology enhances teachers' attitudes toward inclusion of technology, which yields improved implementation (Donovan et al., 2007; Penuel, 2006).

Because trips to a computer laboratory have been found to negatively impact regular use, students require computers in the classroom (Penuel, 2006). Regular technical support ensuring equipment performance, software maintenance, and teacher education are essential to going digital in the classroom (Evmenova et al., 2016). When teachers are not confident that there is technical and administrative support, they are reluctant to invest the necessary time to prepare lessons oriented students to technology usage (Donovan et al., 2007; Penuel, 2006; Soobin et al., 2016).

### **Conclusion**

Despite the escalation of the use of technology and computers in the classrooms, empirical evidence supporting the expenditures this requires is lacking. Simply investing in technology in a classroom does not ensure students will achieve improved writing outcomes, and the studies cited indicate that there are both positive and negative implications of students using laptops to write and take notes. More research is needed to explore how computers can be used to maximally support writing and learning. Clear definitions of technology use and learning goals, and consistent evaluations of writing outcomes are needed (Andrews et al., 2007). “Usage of computers” needs to be clearly defined, and the implications of resource availability and software capabilities for impacting learning should be investigated further (Bebell et al., 2010). Teaching strategies and teacher perceptions of computer use need to be taken into consideration as well.

Though positive outcomes are reported with computers, the inconsistency of the involved variables weakens the conclusiveness of current research (Andrews et al., 2007). Also, the benefits of handwriting should not be ignored as classrooms become digital (Fitzpatrick et al., 2013). Controlled studies examining the effects of using technology and of using or not using handwriting on writing outcomes should continue. Results may continue to change as technology and students’ exposure to it in and out of school for writing tasks evolves and as technology and technological devices rapidly change.

## **CHAPTER III**

### **METHODS**

The purpose of this study was to examine the impact of laptop usage on middle school students' writing. The students were familiar with laptop usage, word processing software, and classroom conventions for saving, retrieval, and printing of documents.

#### **Design**

The study used a quasi-experimental design, with a nonrandomized, convenience sampling of seventh- and eighth-grade students, for two posttests, administered within a six-week period.

#### **Participants**

The participants were 20 male students in seventh- and eighth-grade classes in a private school in Baltimore, Maryland. The seventh-grade class was one of five parallel classes in the grade and was a middle track. There were two honors' classes, two middle tracks, and one low level track. The eighth-grade class was one of four parallel classes in the grade and was a low-middle track. There were two honors' classes and two low-middle tracks. The school, comprised of a preschool, elementary school, middle school, and high school, services over 1,000 boys. The seventh and eighth grades are part of the middle school division.

#### **Instruments**

The instruments used in the study were two similar descriptive writing assignment prompts (See Appendix A) as well as a teacher-designed scoring rubric, with weights assigned to content, mechanics, and presentation of writing assignment (See Appendix B).

#### **Procedure**

During the month before the study was initiated, the teacher assigned and discussed literature selections which modeled descriptive writing and contained literary devices such as metaphors, similes, and sensory words. The participants became familiar with the literary terms. The teacher distributed a booklet of sensory words and projected pictures of objects and scenes. The participants were asked to use the sensory words to describe the scene. The teacher modeled a short descriptive paragraph of a scene. The participants were given four options of scenes or objects and were instructed to choose one to describe.

Approximately one week later, the teacher modelled a three-paragraph descriptive essay, using a picture as part of the prompt. Participants responded to the prompt using a pen and paper. The scores were graded using the rubric. After two weeks, the participants were given a different picture and similar prompt and were instructed to respond to the prompt after the teacher provided a modeling of the second assignment. The second time, an intervention, the laptops, was used. The results were scored using the identical rubric.



## CHAPTER IV

### RESULTS

This study examined whether the use of computers impacts the quality of writing of middle school students. Data gathered on the subjects in the study included descriptive essays written with the use of computer and descriptive essays written without the use of a computer. Data were analyzed using the dependent or paired *t*-test. To account for variability in student writing ability, the same group was tested for computer use and nonuse. This allows for differences in scores to be attributed to the dependent variable, the computer, and not writing ability. Table 1 displays the measures of central tendency for the variables, and Table 2 displays the results of the dependent *t*-test statistical analyses.

Table 1

*Measures of Central Tendency*

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Computer Post Test Score	91.10	20	6.240	1.395
Writing Post Test Score	88.10	20	8.194	1.832

Table 2

*Results of the Dependent T-Test Statistical Analyses*

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
3.000	8.272	1.850	-.871	6.871	1.622	19	.121

This analysis yielded results indicating no statistical differences between the writing posttest and the computer posttest.

## **CHAPTER V**

### **DISCUSSION**

This study examined whether the use of computers impacts the quality of writing of middle school students. Statistical analyses presented in Chapter IV indicate that the null hypothesis should be retained; namely, that the writing of middle school students who use the computer to write will not be significantly different than that of middle school students who do not use the computer to write. Findings of this study do not suggest that computer use is associated with improved writing outcome.

#### **Threats to Validity**

In terms of this study, the most significant threat to the external validity of the study is the sample. The convenience non-random sampling—20 boys, all in a non-honors track—cannot necessarily be generalized to a larger population. Perhaps if honor students or students of female gender were included, they would perform differently. Thus, it is not possible to generalize from this study beyond the participants in the study.

There are also internal threats to the validity of the study. One threat is that of instrumentation. The researcher is measuring the results of the posttests. The grading of writing is somewhat subjective. The researcher may have expected some students to perform well and therefore may not have precisely measured the results. When the essay rubrics seemed to follow a pattern, perhaps the researcher's expectations played an unwitting role in the grading. Additionally, there may have been instrumentation decay. At the beginning of the grading process, the researcher may have been more attentive to detail than at the end of the process.

Finally, there is the internal threat of history. History may include events or effects of events that occur prior to this study that may contribute to its results. In this study training in the

use of computers and Microsoft Word were not part of the procedure. If the students did not have sufficient knowledge of and expertise with the technology, then possibly the effects of its usage cannot be measured accurately. Additionally, there may be significant variances in the subjects' prior knowledge of technology before the intervention, creating a lack of uniformity in the procedure. Lack of knowledge of Microsoft Word could significantly alter the effects of using the computer intervention.

Another aspect of history is that the students in this school who are non-honors often lack motivation. Their past experiences have caused them to have low expectations of themselves. So the lack of motivation may be affecting the results as opposed to the independent variable, the computer intervention. Students who are not motivated might just ignore misspelled words, even if those words are indicated by the software. These students may be not be taking advantage of helpful writing tools due to a type of learned “laziness” and low self-expectation. This might explain why there were many sentence fragments despite the use of the intervention. Despite sentence fragments being consistently flagged by Microsoft Word, most students did not bother to correct them.

### **Comparison of the Findings of This Study to the Findings of Previous Research**

The purpose of this study was to measure the impact of computer use on the quality of writing. No statistically significant benefits were discovered. Though threats to the validity of this study have been suggested, the results, nevertheless, underscore the need to investigate the benefits of embracing technology in the classroom. This study seems significant since it is one of the few studies that uses the same subjects for testing—with and without the intervention. When subjects act as the control group, this controls for the variety of writing abilities that are naturally present.

The researcher is experienced at teaching descriptive writing and is familiar with the maturation of the students and its impact on their writing. Accordingly, the researcher is also comfortable with the two-week time frame of the tests, and that results should be similar if it were not for the intervention. Though no statistically significant differences were found, most essays written using the intervention scored a higher number of points on presentation, yielding a slightly raised score. Also, there were some test scores that were significantly improved by the intervention. Conversely, there were some test scores that decreased significantly with the use of the intervention. This is consistent with what the researcher has seen in her classroom for over a decade. The researcher has always had computers or laptops in the classroom. For the duration of the study, there was a 1:1 ratio of computers and students. The researcher has previously noticed that individual writers have their own style. Some are able to construct writing without the use of rough draft or organizer and proceed right to the computer with high caliber results. Others need to pencil every word of their rough draft before nearing a computer, or they are at a complete loss and totally disorganized when they approach the computer. In this vein, this study is consistent with the inconclusiveness of the research in Chapter II.

The previous research reviewed in Chapter II noted that the rise of technology's presence in the classroom does not translate to its success in the classroom. Technology's impact on writing is not conclusive (Andrews et al., 2007; Fitzpatrick et al., 2013). Though there have been studies, the research is complicated by unclear definitions of, availability of, and teachers' familiarity and comfort with technology (Bebell et al., 2010; Cottrell, 2016; Soobin et al., 2016). The literature review presented the positive and negative implications of computer use as well as outlined the impediments to implementation of technology in the classroom.

One of the negative aspects of technology noted was that using a pen or pencil rather than a keyboard yields longer essays written in a shorter period of time. This finding was found with disabled and nondisabled students (Berninger et al., 2009). Some studies pointed out that not only was the length of writing improved when constructed using a pen and paper, but the quality and level of content as well. (Berninger et al., 2009). A unique brain engagement appears to be taking place when students form letters with a pencil (McDaniel, 2014). A student's necessary ability to write handwritten essays for standardized tests in a given time frame may be negatively impacted by regular computer use (Fitzpatrick et al., 2013).

Other adverse features of computer use observed were the necessity of keyboarding skills, fine motor coordination, and ability to avoid distractions (Kemker et al., 2007). Additionally, students begin relying on tools such as spellcheck and lose some autonomy in the writing process. Students with learning disabilities may not even be able to make use of spellcheck, since they may not recognize the error of a correctly spelled homophone in a sentence (Kemker et al., 2007).

The review also offered many positive aspects of computer use in the writing process. Increased motivation, content level, and structure of the process are some of the benefits noticed among students who use technology to write essays (Penuel, 2006; Donovan et al., 2007; Cotrell, 2016, Kemker et al., 2007). There is the suggestion that typing frees up the mind for higher level processing (Berninger et al., 2009). Grammar and spelling are found to be improved when using a word processor. Increased self-esteem and improvements in organization, style, length, attitude, convention, and voice of writing are other attributes noted to improve when technology is incorporated (Andrews et al., 2007).

Students need to know how to type essays on a computer, regardless of their preference. New standards emerging on the college, high, middle, and elementary school level may require computer file submissions (Evmenova et al., 2016). Dysgraphia and dyslexia are just some of the handwriting issues that are helped with word processor proficiency (Eden et al., 2011). To be competent and effective users of technology, students need to use the powerful spelling, dictionary, and thesaurus tools that Microsoft Word offers (Vue et al., 2016). It will unlikely remain a choice whether students will use technology or not.

With the inevitability of students' need to use technology at some point in their education, the difficulties that arise as schools go digital must be highlighted. The third section of the literature review addressed those issues. The schools obviously need to have the funds to allocate the necessary equipment. However, buying computers is not nearly enough. The teacher is still the primary force in the classroom and critical to the process of incorporating technology into the curriculum (Donovan et al., 2007). Technology needs to be paired with effective teaching. Teachers require training, ongoing technical support, and hardware and software maintenance to successfully use computers to teach writing (Evmenova et al., 2016). If an educator's technological and concerns and needs are valued, he or she is more likely to be an active participant in the process.

The literature review concluded with the assertion that research is inconclusive. More controlled studies should be conducted. Though research should continue, it must be with the realization that technology is constantly changing, and, therefore, the studies may correspondingly be in a state of flux.

### **Suggestions for Future Research**

The study's purpose was to examine the impact of the use of laptops on writing. There was no statistically significant benefit yielded using the intervention. However, the author of the study notes that most students did achieve higher points for presentation, signifying that the appearance of the writing associated with computer use was more attractive. The author also noticed significant improvement for some students using the intervention as well as a decrease in writing outcome for other students. Perhaps there are characteristics of students who benefit from the computer intervention. So studies that further analyze the success of the intervention as well as its lack of success may point to the traits of students who could benefit from a laptop.

It is possible that a larger and more diverse sample would yield other results. The classes that were involved were in middle to low tracks; their motivation was lacking. If more motivated students on a higher track were assessed, it is possible that results would be different. Possibly including members of the opposite gender would alter the outcome. Also, the training with technology was not controlled; participants had varying degrees of comfort with word processing software. Students' text transcription skills also varied greatly. Future studies could incorporate other types of software that help writers. Teachers would need to be a part of that process. If they are not fluent with the software, it is unlikely that they can promote its use. Perhaps, engagement could be measured, in addition to improved outcome.

### **Conclusion**

Long-term benefits of technology use may be noted with increased engagement. The need to further research the benefits of technology before outlaying significant expenditures is indicated. Ultimately, effective teaching needs to be paired with any further study in order to accurately assess the technology's efficacy. Technology alone cannot create effective writers.



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## Appendix A

Rubric for Proficiency Scoring

Teacher's Name: \_\_\_\_\_

CONTENT AND FORM		
Paragraphs Well developed paragraphs Shifts in ideas indicated by new paragraphs		8
Interest: Clear, imaginative writing, well developed topic		5
Coherence Strongly defined main idea, clear, logical organization, sentences related to each other		2
Unity Well chosen relevant sentences or details		2
Development Clear; easily followed narrative or exposition		2
Word Choice Specific, figurative language. Similes, metaphors or sensory details. Vivid language. Sophistication.		7
Effective beginning and ending		5
Reveals the writer's feelings and thoughts about the subject		2
Presentation		5
MECHANICS		
Complete Sentences/ No Fragments or run-on's/		5
Punctuation marks used correctly		2
Infrequent mistakes in capitalization		2
Infrequent mistakes in spelling		3
		50

## Appendix B

Choose one of the three pictures to describe. You must use sensory words – you can incorporate a story line. Use spatial transitions to describe a scene. Move up and down, left to right, or from near to far or far to near. Your essay must be three paragraphs.

Spatial transitions : Along the edge, Above, In the center, To the right, Behind, Below, Outside, Inside, To the left	
Minimally Three Paragraphs	
Sensory Descriptions; vivid language; metaphor or similes	
No Fragments or Run on Sentences	
Proper Punctuation and Capitalization	
Spelling	



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