

EXPLORING STUDENTS' WRITING ON A COMPUTER VERSUS
PAPER AND PENCIL

A Thesis Presented to the Faculty
of
California State University, Stanislaus

In Partial Fulfillment
of the Requirements for the Degree
of Master of Art in Education

By
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December 2019

CERTIFICATION OF APPROVAL

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DEDICATION

The thesis is dedicated to my beloved grandma, Ky Kea. Throughout her struggles, she found the strength to persevere despite any obstacles. Her drive and determination has instilled the value of hard work and dedication in my family. Thank you for being our matriarch and setting the foundation to never give up on our goals in life.

ACKNOWLEDGEMENTS

I take this opportunity to express my gratitude to everyone who supported me throughout the course of this thesis research.

I am extremely thankful and indebted to my advisor, Dr. Catharyn Shelton, for sharing her expertise, guidance, and valuable feedback in writing this thesis. Her unwavering support and patience was essential throughout this process.

My sincere appreciation to Dr. Dawn Poole for her support and insightful knowledge that helped motivate me in pursuing a degree in Educational Technology.

I am grateful to Dr. Jon McFarland for serving as a second committee member and offering his time to review my document.

My appreciation also extends to the students who were involved in this research. Without their passionate participation and input, the quality of my research would not have been as rich and informative.

Finally, I want to express my profound gratitude to my family who have always provided me with unconditional love and support. To my parents, Phal and Mach, for always putting your children first and wanting the best for us. You are the ultimate role models. What I have done, I have done to make you proud. To my husband, Sokhan, for believing in me and motivating me through every step of the process in writing this thesis. Your tremendous patience, understanding, and encouragement made achieving my educational goals possible.

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ABSTRACT

This study examined how writing scores and experiences compared for upper-elementary students who composed text via *Google Docs* versus traditional writing with paper and pencil. The fifth-grade participants in this study completed a three week writing unit and produced a multi-paragraph opinion essay that was assessed. Participants then took part in a post survey to share their experiences, successes, and challenges in writing with their assigned writing medium. The treatment group had a nominally higher overall mean score than the control group, with writing performance scores looking similar across both groups. Data from the survey responses revealed that the treatment group edited their writing more often than the control group and that they had higher levels of engagement and more positive attitudes in writing than the control group. However, the control group revised their writing more often than the treatment group. Themes from the open-ended responses centered around the ideas of distractions, neatness, and spelling, with students citing pros and cons for both writing with paper and pencil and a computer. It's also important to note that regardless of the method students used to compose text, their writing preferences played a role in their writing experience.

CHAPTER 1

INTRODUCTION

Around the world, technology has evolved rapidly over the past few decades. As society moves towards a more digitalized era, the need to integrate technology into daily lives seems to be increasingly valuable, common, and expected. As a result, across the United States (U.S.), there seems to have been a shift in school districts aiming to become one-to-one (1:1) with technology, in which each student has their own computer device to use throughout the school day.

Schools' interest in pursuing 1:1 initiatives in schools may be a valuable way to support students in mastering the knowledge and skills required to work in the new millennium. Integrating technology in schools can be understood as a "quiet revolution" where it will eventually become a permanent part of the educational system (Dwyer, 1996). By appropriately integrating technology in the educational setting, it can impact student learning. Effective use of technology creates a connection between learner and content (Hertzog & Klein, 2005). According to Dwyer (1996), computers play a great role in creating productive and engaging learning environments. Some of the ways in which students can use computer technology in the classroom includes using a writing process software to create a document, communicate and collaborate with others through emails, video conferencing, and other collaborative platforms, playing educational online games, creating presentations and projects, and retrieving information. A common theme that

was identified among research on 1:1 implementation is the positive impact computers have on student engagement (Mouza, 2008). Computer usage links student learning to active engagement, participation in groups, frequent interactions, and connection to real world context (Mouza, 2008). Providing classrooms with technology integration, such as 1:1 devices, may be critical in providing students with 21st century skills which include communication, collaboration, and critical thinking.

While there is evidence that students' learning is improved with technology integration (Mouza 2008), providing laptops and computers is not guaranteed to increase students' achievement and learning. Effective 1:1 implementation falls on the responsibility of the teacher (Bebell & O'Dwyer, 2010). Educators who use a variety of technology strategies and tools may enhance students' educational access and opportunities to increase their achievement. The SAMR model framework developed by Dr. Ruben Puentedura, which stands for Substitution, Augmentation, Modification, and Redefinition, explains four stages of which technology can be integrated in the classroom (Hooker, 2016). At the substitution stage, technology acts as a direct substitute for the tool needed to complete the task. Students can swap out the paper and pencil method with a computer laptop to type out an essay. At the augmentation stage, technology enhances the substitutive task (Hooker, 2016). Classmates can leave comments and feedback on the essays of their peers through word processor software. Writing tools like spell check, an online dictionary, and voice typing may also enhance students' writing. Modification is the third stage of the SAMR model, which allows for significant redesign of how information is delivered

and learned (Hooker, 2016). Students can research information online, edit the document, and create a blog post that can then be shared online with an audience. At the redefinition stage, technology allows for tasks that were previously never conceived (Hooker, 2016). Students may connect with experts through video conferences, co-write a post with someone from a different place, create a podcast or video that can be listened to or viewed by others from around the world. Thus, appropriately using technology in the classroom can potentially have a substantial contribution to children's learning (Hertzog & Klein, 2005).

For the current study, I explored technology integration in a 1:1 elementary school environment, focusing on the subject area of writing. Personally, I believe that writing is an important skill in all stages of life. It is a lifelong skill that students begin to learn in the primary grades. As early as in Kindergarten and first grade, computers are most frequently used for word processing (Hertzog & Klein, 2005). In upper levels of the primary grades, fourth grade teachers reported that writing was one common use on laptops for students (Suhr, Hernandez, Grimes, & Warschauer, 2010). Advancing to the university level, one of the most consistently required courses in post-secondary education is writing. Dating back to 1874, Harvard University was the first college campus that required students to take a mandatory written entrance exam (Rose, 1985). Soon after, other colleges began to adopt this idea. With high standards and levels of expectations set forth by the Common Core State Standards (CCSS), educators must teach writing well in order for students to be successful throughout their educational experience.

Statement of the Problem

Writing is essential for student success in education. The writing standards in the CCSS may be a complex skill set for many students to master. Those struggling in writing may face challenges such as composing text. Although students may have good ideas, they need to be able to demonstrate the commands of writing, which include generating ideas, using correct grammar, paragraphing, and story structure (Dunn & Finley, 2010). Despite many school districts adopting writing curriculum and writing applications aligned with the CCSS, learning to write is a potentially huge challenge.

There are multiple components students are expected to demonstrate in order to be considered proficient in writing. Students need to acquire grade-level language and content, have organizational skills, demonstrates command of the English grammar, and correctly use capitalization, punctuation, and spelling when writing. In addition, with the rapid increase of available technological devices, educators have changed teaching practices to accommodate opportunities of technology use (Bebell & O'Dwyer, 2010).

Perhaps, the increase in the use of computers and laptops in the classroom will help close the gap in students' writing performance and the CCSS expectations. Using computers to write and compose a document may motivate students to be more focused. Hertzog and Klein (2005) claimed that technology enhanced students' writing because the students were able to focus on the flow of ideas, instead of

focusing on how to write out letters and words. The revision and editing tools, such as adding and deleting text and the use of spell check, may also help students easily organize and edit their work. Editing writing becomes easier because students do not need to physically erase their writing, tear their paper, or correct any mistakes (Hertzog & Klein, 2005). In addition, since students writing is saved on the computer, they can elaborate and revise their work multiple times with ease (Hertzog & Klein, 2005). Being able to create a neat looking document may also allow students to easily read their writing and find mistakes that may not have been as noticeable. Contrary, potential challenges with writing using a computer may be an issue if students are not attuned with an activity. There will be times when bugs and glitches may occur, the internet connection is unreliable, students are distracted, and test the boundaries of what is and is not appropriate to do in class, (Hooker, 2016).

To explore the impact of integrating technology on elementary students' writing achievement and experiences, in this study I compared students who used a word processing application to plan and compose text with those who used the paper and pencil method. The word processing application used in this study was Google Docs. Though other word processing applications were available, the participants in this study were familiar with using Google Docs. The teacher was also more knowledgeable and comfortable with Google Docs among other word processing applications. By exploring students' writing performance along with their perceptions of the experience, I aimed to understand potential impacts of technology on writing in the upper elementary setting.

Significance of the Study

The findings of this study adds to the research available on the relationship between technology and student writing in the elementary setting. Information gathered may help educational leaders make informed decisions regarding the value (or lack thereof) of implementing 1:1 devices when it comes to supporting elementary school students to develop as writers. Findings will also provide educators with information regarding upper-elementary students' writing using a web-based word processor versus the traditional paper-and-pencil method. By understanding the impact of writing using a word processor versus the paper and pencil method, educators may be able to more effectively plan curriculum, lessons, and instructional strategies that will be most beneficial for students to demonstrate proficiency in writing. By understanding which instructional tools to incorporate in writing activities, teachers may ultimately be able to better support students with learning opportunities that enable them to reach college, career, and life readiness.

Research Questions

The purpose of this study was to compare fifth grade students' writing scores and writing experiences when using Google Docs to compose text with students who used the traditional paper and pencil method for writing. I asked the following research questions:

1. According to writing rubric performance scores, how do writing scores compare for students who compose text via Google Docs versus traditional writing with paper and pencil?

2. According to student survey responses, how does the writing experience differ for students who compose text via Google Docs versus traditional writing with paper and pencil?

Definition of Core Concepts

Common Core State Standards: A set of learning goals developed by the states for what students should know and be able to do by the end of each grade level from Kindergarten to 12th grade. (Common Core State Standards Initiative, 2019).

Editing: The task of correcting the mechanics of writing, which include spelling, punctuation, capitalization, and grammatical mistakes (Dalton & Council for Exceptional Children, 1989).

Google Docs: A free, web-based word processing application through the Google software that can be used for creating, sharing, and editing documents (Peltier-Davis, 2011).

Revision: The process of identifying and resolving problems that interfere with the writer's message, such as poor organization or lack of detail by elaborating on sentences, adding more details, and changing or deleting words (Dalton & Council for Exceptional Children, 1989).

Technology Integration: The use of incorporating technology tools and resources to enhance and support educational environments (Mischra et al., 2009).

Word Processing: Writing, editing, and producing text through the use of a computer program or application (Peltier-Davis, 2011).

Summary

As technology is being integrated into classrooms more commonly today, the need to understand different technology tools and strategies may be helpful in promoting students' educational achievements. With writing being an essential skill for students to be successful in education, this study will investigate the relationship between using a word processing application to write versus the traditional paper and pencil method. The study will compare students' writing performance scores and writing experiences across both writing mediums.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to compare the writing scores and writing experiences between students who composed text using Google Docs with students who used the paper and pencil method during a three week writing unit. In this chapter, I will discuss the theoretical framework of writing and present a brief review of the literature.

Theoretical Framework

The cognitive process theory of writing, developed by Flower and Hayes (1981) established the idea that writing was a complex system that emphasizes on the importance of the cognitive process. This theory of writing was based on four major points: (1) writers encounters a set of thinking processes when composing text; (2) the thinking process consists of higher-order level of organization; (3) composing text includes setting goals; and (4) to complete the writing tasks, authors create macro and micro goals (Flower & Hayes, 1981). The research focused on how writers composed text through major steps in the writing process (brainstorming, prewriting, drafting, revising and editing) before publishing. It was first assumed that the writing process was a linear process, in which previous steps in writing were not revisited. However, Flower and Hayes' theory found that writers consistently revisited different steps in the writing process.

In the classroom, students are expected to use writing as a tool for learning. By understanding the cognitive process theory of writing (Flower & Hayes, 1981), students are given a method of thinking through ideas when composing text. By breaking the writing task into smaller steps, focusing on the four major points supported by the cognitive process theory of writing, it allows students to produce quality writing, in which they are able to constantly revisit work prior to submitting a final copy.

Along with good writing instruction, technology can open the world of written communication to students and make writing less challenging, as they compose text. By implementing 1:1 devices, such as a computer laptop, in the classroom, students can focus on using word processing applications to improve writing literacy. Computers can also serve as a revising tool, where students can quickly insert text to elaborate on sentences, change words, and save updated drafts when needed. By understanding the cognitive process theory of writing, this study will uncover how students compose text using Google Docs in comparison to the paper and pencil method.

Review of Literature

There has been an increase in integrating technology in schools that is more frequent now than before. Project Tomorrow, a nonprofit group who has collected and reported on the views of over five million educators, students, administrators, and parents, from more than 30,000 schools in all 50 states in the U.S. have reported that 60% of school principals have implemented a 1:1 initiative in 2017 to support efforts

to improve educational equity among students (Project Tomorrow, 2018). As classrooms shift from using the traditional paper and pencil to becoming a 1:1 school, where students each have their own laptop device, how students are learning and how educators are teaching has changed. This literature review examined students' perceptions of using technology in the classroom for learning, and shift into discussing the outcomes of technology integration, focusing on classroom learning environments and student writing.

Mouza (2008) examined the outcomes and implementations of using laptops in a low-income minority school. She compared two classrooms using laptops with two non-laptop classrooms of the same grade level. Two of the classrooms were of 4th grade students, while the other two classrooms were of 3rd grade students. Qualitative and quantitative data were collected from the groups, which consisted of classroom observations, teacher interviews, student questionnaires, and study focus groups. Results from the study found that students perceived computers as a learning tool and indicated that computers foster creativity and exploration. Findings reveal a significant interaction between grade levels and technology in the classroom on attitudes towards school, ($F(1, 96) = 3.84, p = .05$). In particular, students preferred word-processing on computers as opposed to hand writing documents. Computers made it easier to find mistakes, edit and delete text, and create neat documents.

To examine the impact of 1:1 laptop use on English language arts (ELA) test scores for upper grade elementary students, Suhr, Hernandez, Grimes, & Warschauer (2010) conducted a quantitative research study. The authors described this age group

of students encountering the “fourth-grade slump,” referring to the slowdown of reading and writing progress in upper elementary grades due to the transition from learning to read to reading to learn. Students shift from focusing on familiar, high frequency words to less familiar academic vocabulary and abstract ideas. Researchers had a treatment group (students in a 1:1 laptop program) and a controlled group (students not participating in the 1:1 program) to compare changes in ELA test scores. Interviews, observations, surveys, and documents were used to collect data. High levels of student engagement and enthusiasm was also reported by teachers and observed by researchers in the treatment group. Results shows that after the 2nd year (year 2), students in the laptop program significantly outperformed the non-laptop students in their changed scores for writing strategies ($p < .05$) and literary response and analysis ($p < .01$).

In Suwantarathip & Wichadhee’s (2014) study, the writing abilities of students using Google Docs on writing assignments were compared to students in a face-to-face classroom. Participants in the sample were 80 students enrolled in two sections of an English course in a private university in Thailand. The researchers in this study gathered data using three instruments: a writing test and two questionnaires. Findings in the study showed a significant difference between the two groups ($t = 2.253$, $df = 78$, $p = .027$). The group with students using Google Docs had a higher mean on writing scores than the group that worked in a face-to-face setting. To add, the students perceived Google Docs to be an easy learning tool to use and had positive attitudes about writing activities through Google Docs.

Similarly, another study investigated the effectiveness of using a computer-based writing task using Google Docs with a traditional, in-class pen and paper writing. (Ambrose & Palpanathan, 2017). Participants included 114 high school senior students who participated in both writing tasks – the pen and paper task and the writing task using Google Docs. Data were collected using questionnaires, writing samples, and structured interviews. The results indicated that the majority of participants favored using computer technology, in particular Google Docs, in their writing class. In addition, students had significant improvements in the computer-based writing task versus the pen and paper writing task. However, there were variations in responses on how students perceived how useful Google Docs was when compared to other writing.

Another study examined the impact of a laptop immersion program at a middle school (Gulek & Demirtas, 2005). Participants consisted of 259 students from grades 6-8. The data gathered include overall grade point average (GPAs), grades at the end of the course, writing test scores, and standardized state test scores. Results found that after one year in the laptop immersion program, the laptop students had significantly higher achievements in all areas measured.

On the other hand, there are arguments supporting the claim that incorporating technological devices in the classroom can have negative effects. Muyingi (2014) examined the claim of how laptops can be a hindrance to student learning. Using questionnaires of 213 students, results found that there was a significant impact of digital distraction that influenced student learning.

Summary

The literature review suggests that laptop computers support students in writing tasks. Writing scores typically improved with the use of laptop computers (e.g. Ambrose & Palpanathan, 2017; Gulek & Demirtas, 2005; Suhr et al., 2010; Suwantarathip & Wichadhee, 2014) which may seemingly be due to the increased opportunities that promote student creativity and innovation (Mouza, 2008) and the ease of use (Suwantarathip & Wichadhee, 2014). Though there can be a negative impact on student engagement, such as creating digital distractions (Muyingi, 2014), students generally had positive attitudes when using a word processing application to complete writing tasks (e.g. Mouza, 2008; Suhr et al., 2010). It is also important to note the variation of responses on how students perceived writing between the use of Google Docs compared to other writing.

CHAPTER III

METHODOLOGY

The use of computers in the classroom may give students opportunities to perform certain tasks that are not easily done without such technology, such as researching a topic via the internet, making digital presentations, and writing essays. The current study explored how two groups of fifth grade students engaged in a three-week writing unit either using Google Docs to compose text or using the paper and pencil method. The study took place within my own fifth grade classroom at the end of the school year. Over the course of three weeks, all students participated in a writing unit and developed a multi-paragraph opinion essay as part of the established curriculum for their grade level. Quantitative and qualitative data were collected in two forms: 1) students' writing achievement scores evaluated by a grading rubric, and 2) students' survey responses designed to investigate students' perspectives on the writing experience. Collecting both quantitative and qualitative data allows researchers the ability to develop a more complete understanding of the social phenomena (Creswell & Plano Clark, 2010). This chapter presents the participants, research design and instrumentation, and data analysis procedures of my research study.

Participants

This study was conducted at a public, Title 1 elementary school located in the Central Valley of California. This kindergarten thru sixth grade (K-6) school is one of

22 elementary schools in the district. The school district also has four junior high schools and nine high schools. There were 347 students enrolled at the elementary school, with 86.7% of students considered socioeconomically disadvantaged as they qualified for free or reduced lunch (California School Dashboard, 2018). The ethnic diversity of students at this school consisted of 52.2% Hispanics or Latinos, 20.7% white, 8.1% Asian, 6.1% being two or more races, 2% African Americans., Pacific Islander (2%), Filipino (0.9%), and American Indian (0.3%). The demographic representation of students at this school was similar to that of the state of California, which includes 54.2% Hispanics or Latinos, 23.6% white, 9% Asian, and 5.6% African American students (California Department of Education, 2017). The percentage of students that make up the English language learner population at the school was 26.5%. There were two classes per grade level from Kindergarten through 6th grade. The school's population also accounted for the students in the preschool, Head Start, and special education autism program. Participants in this study were students in my fifth grade class at this school site.

Through convenience sampling, this study was conducted with 20 students from my fifth grade class. Students were divided into two equal groups using a stratified sampling approach. Students were stratified based on writing achievement levels as a way to make the treatment and control groups more comparable considering the small sample size. After creating comparable groups, random sampling in the form of a coin-toss was used to determine which group was the control group and which group was the treatment group. The control group was made

up of three boys and seven girls. Three of the students in the control group were classified as English learners. One student was designated as *well developed*, while two students were designated as *somewhat developed* on the English Language Proficiency Assessments for California (ELPAC). One student in this group had an individualized education plan for English Language Arts. Across the control group, there was one student who performed below grade level expectations, four students who were progressing towards grade level expectations, three students who met grade level expectations, and two students who exceeded grade level expectations in writing. The treatment group was comprised of six boys and four girls. There were two students in the treatment group that were classified as English learners. One student was designated as *well developed* while the other students was designated as *somewhat developed* on the ELPAC. Five students in this group were progressing towards grade level expectations, four students met grade level expectations, and one student exceeded grade level expectations in writing. Both the control and treatment group had one student who had spent less than two years living in the United States.

Students who were assigned to write using the traditional method of paper and pencil were the control group, while students who used the laptop and Google Docs for writing composition during this study were the treatment group. Students in the treatment group had access to 1:1 computers laptops that were stored in computer carts in the classroom. These computer laptops were not taken home. In the beginning of the academic year, all students had been assigned individual computer laptops with personalized login information. Since the study was conducted in the last trimester of

the school year, all students were familiar with how to use the computer laptops, as I had integrated the use of computers as part of students' daily learning consistently throughout the school year. These students also attended a thirty-minute computer literacy class with a computer literacy teacher twice a week. Skills taught by the computer literacy teacher included keyboarding, creating documents and presentations through Google applications, navigating and researching the internet, and utilizing different digital tools, among other skills. The computer literacy class was offered for students at the school site beginning in first-grade, so the fifth-grade students in this study had up to four years of computer literacy instruction at the time of the study. Because students had background experience with how to use Google Docs as a writing tool, the three-week unit used in this study did not include formal instruction on computer skills. Instead, students in the treatment and control groups both focused on writing content over the three weeks.

Research Design

This study collected both quantitative and qualitative data. Quantitative data were used to generalize the results of the students' writing scores across those who composed text with Google Docs versus those who used the traditional paper and pencil method. Qualitative data was used to gain insight into the underlying opinions and perceptions of participants. Specifically, I asked students to discuss the successes and challenges of writing to see if students' experiences differed across the treatment and control groups.

In this study, I used Voyager Sopris Learning's *Step Up to Writing* curriculum, provided by my school district to teach writing standards based on the CCSS. Quantitative data was gathered and analyzed from (a) student writing scores and (b) a post-study student survey. Qualitative data was also collected from the post-study student survey. The student survey was developed by myself and my graduate research advisor through an iterative approach. Rooted in key constructs from the literature review, the survey included items addressing the affordances and challenges students experienced when writing with paper and pencil versus a computer. I developed the survey through piloting it with four non-participants who were my former students from the previous year. In this pilot, participants took the survey, then we discussed and revised the survey items for students to be able to make meaning out of the survey items. Once I received their feedback, I then created a final draft of the survey. The survey employed a Likert-scale and was administered to students at the end of the three-week unit.

During the three-week writing study, both participant groups spent between 30 to 40 minutes each day on the writing unit, completing identical assignments. Both groups had access to all of the handouts and graphic organizers used in the writing unit. The control group was allowed to use a hard-copy dictionary and thesaurus, while the treatment group had access to the digital tools on Google Docs. The digital tools included spell-check, grammar suggestions and warnings, autocorrect, and an online dictionary and thesaurus. Other digital tools, such as voice-to-text, were available but not used. For both groups of participants, the objective was for students

to create a multi-paragraph opinion essay in response to a writing prompt. The writing prompt was: *Should students learn a foreign language in school?* The teacher introduced all students to the writing process and provided them with supplemental materials from the *Step Up to Writing* curriculum. Lessons were broken down and aligned with Flower & Hayes (1981) cognitive process theory of writing. The 5 main parts included: brainstorm and prewriting, drafting, revision, editing, and publishing. Both groups followed the same 5-step writing process. Appendix D describes the activities the participants completed each day during the writing unit.

In the treatment group, students used 1:1 computers to prewrite, write, revise, edit, and publish their writing through Google Docs. In the control group, students used the traditional paper-and-pencil method to complete the 5-step writing process. At the end of the study, students in both groups were given the Likert-scale survey and their writing was assessed. Student writing scores were obtained using the district's writing rubric (Appendix E).

Instruments

Writing Performance Scores

To examine students' writing performance scores, the completed multi-paragraph essays were assessed using a district-created 36-point rubric that used a four-point scale to evaluate students on nine different aspects of writing (Appendix E). The four-point scale that included: (1) below expectations, (2) progressing toward expectations, (3) meeting expectations, and (4) exceeds expectations. For the analysis used in this study, I grouped the nine pre-existing rubric areas into five aspects: (1)

introducing the topic and stating an opinion, (2) organization, (3) sentence structure, (4) capitalization and punctuation, and (5) spelling. I calculated an average score for each of the newly created five aspects for each student. At the end of the writing unit, myself and another teacher in the same grade level analyzed each essay together. We spent a total of four, thirty minute mornings in the same room, sitting next to each other grading each essay together. We took turns reading the essays out loud and used the rubric to score the writing. Each essay had a final score out of the 36 points possible. When we disagreed on a particular score, we referred back to the language of the rubric and the student's essay to resolve any conflicts through discussion. The names of students were hidden to eliminate any biases in grading. This allowed for consistency in scores and eliminated possibilities of scores being unreliable.

Survey

Participants in this study responded to both statements and questions via a written survey that centered around key constructs from the literature review regarding the writing process. Key constructs included the following: (1) revisions, (2) editing, (3) engagement, and (4) attitudes about writing. The survey was administered on *Google Forms* at the end of the study, after the writing task was completed. The survey included items using a four-point Likert-scale along with a "Not sure / can't answer" option, and also questions soliciting short answer responses. The short answer responses pertained to the successes and challenges on the writing task. Table 2 presents the survey for the treatment group which included survey items related to writing using a computer laptop. Participants in the treatment group had

two additional items on the survey that addressed both writing with a paper and pencil and writing with a computer laptop, as participants in this group has had prior experiences with writing using the paper and pencil method. Table 3 displays the survey given to the control group, which included survey items related to writing using the paper and pencil method.

Procedures

I began by contacting my principal to share with him the purpose and scope of the study. After proposing my study to the University Institutional Review Board, I obtained an approval letter granting permission to carry out the study (Appendix A). I then drafted, revised, and shared a consent form with potential participants' parents or legal guardians seeking permission to participate in the study (Appendix B). After the parental consent forms were returned, I distributed permission slips to the participants asking for their assent to participate in the study. Appendix C is the participants' written informed assent. Following this, I developed survey items using key constructs from the literature review that centered around the revision process, the editing process, students' engagement with writing, and their attitudes about writing. I then administered a survey in a pilot with non-participants who were my former students. With the non-participants, we discussed and revised the survey items so students would be able to make meaning out of the survey items. Once I received their feedback, I then created a final draft of the survey. Last, once the writing unit was completed, I administered the survey with my whole class at the same time. Survey A was given to the control group; survey B was given to the treatment group.

Ethical Considerations

As the teacher of the participants of this study, I understand that my role may have influenced my behavior and my evaluation of the data. I saw my deep understanding, experience, and connection with my participants as an advantage. Being that I interacted with these participants on a daily basis, I believe my background knowledge of the participants allowed me to understand the context of what the participants shared in their open-ended responses better than if I was an external observer. Nonetheless, to reduce bias or ethical considerations that may have rendered, I confidentially debriefed with another fifth grade teacher to make sense of the responses the participants shared. Additionally, survey responses were anonymous. The data collected from the survey was only accessible through a password protected account and on a password protected computer. The written essays of the participants were stored in a locked cabinet along with the district-created writing rubric scores.

Data Analysis

For this study, all quantitative data collected was entered into Microsoft Excel as well. Descriptive statistics that included frequencies, means, and standard deviations were calculated on students' writing scores and on all survey items that included a Likert scale. The goal was to compare student writing scores and the survey responses across the treatment and the control group.

The qualitative data was organized using Microsoft Excel. For the open-ended items on the survey, I read and reread participants' responses and confidentially

debriefed with another fifth grade teacher to make sense of data that was organized on an Excel sheet. I coded participants' responses using axial coding with open codes by looking for key phrases using different colors to distinguish between phrases with different codes or meanings. After coding all responses, I consolidated the codes into common themes.

Summary

The fifth-grade participants in this study completed a three week writing unit and produced a multi-paragraph opinion essay. The essays were scored by myself and another grader using a district-created writing rubric. Participants then took part in a post survey to share their experiences, successes, and challenges in writing. Data were collected and analyzed using the participants writing scores and survey responses to determine any differences between the treatment and control group and common themes that developed through axial coding using open codes. The following chapter will report the results of the study.

CHAPTER IV

RESULTS

The purpose of this study was to compare fifth grade students' writing performance and experiences when using Google Docs to compose text with students who used the traditional paper and pencil method. This study focused on one fifth grade class with students ages ranging from 10 to 11 years old in the Central Valley of California. Participants of the study were assessed on their writing performance using a district-created rubric and surveyed to gain insight on their experiences during the writing process. Both the quantitative data from the writing scores and survey and the qualitative data from the open-ended questions on the survey explored the following research questions:

1. How do writing scores compare for students who compose text via Google Docs versus traditional writing with paper and pencil?
2. According to student survey responses, how does the writing experience differ for students who compose text via Google Docs versus traditional writing with paper and pencil?

This chapter will present the results of the study in three different sections. First, the writing rubric performance scores will be shared. Then the quantitative results from the survey responses will be shared. Lastly, the qualitative results from the survey responses to describe the common themes that describe participants' writing experience will be discussed.

Writing Rubric Performance Scores

Students' writing performance scores were assessed using a district-created 36-point rubric that used a four-point scale to evaluate students on nine different aspects of writing (Appendix E). The four-point scale that included: (1) below expectations, (2) progressing toward expectations, (3) meeting expectations, and (4) exceeds expectations. For the analysis used in this study, I grouped the nine pre-existing rubric areas into five aspects: introducing the topic and stating the opinion, organization, sentence structure, capitalization and punctuation, and spelling. I calculated an average score for each of the newly created five aspects for each student. Figure 1 displayed the average student writing scores across aspects of the writing rubric for the treatment and control group. The mean overall writing score among the treatment group 2.94 ($SD = 0.15$), which did not differ much from the control group's mean score of 2.90 ($SD = 0.09$).

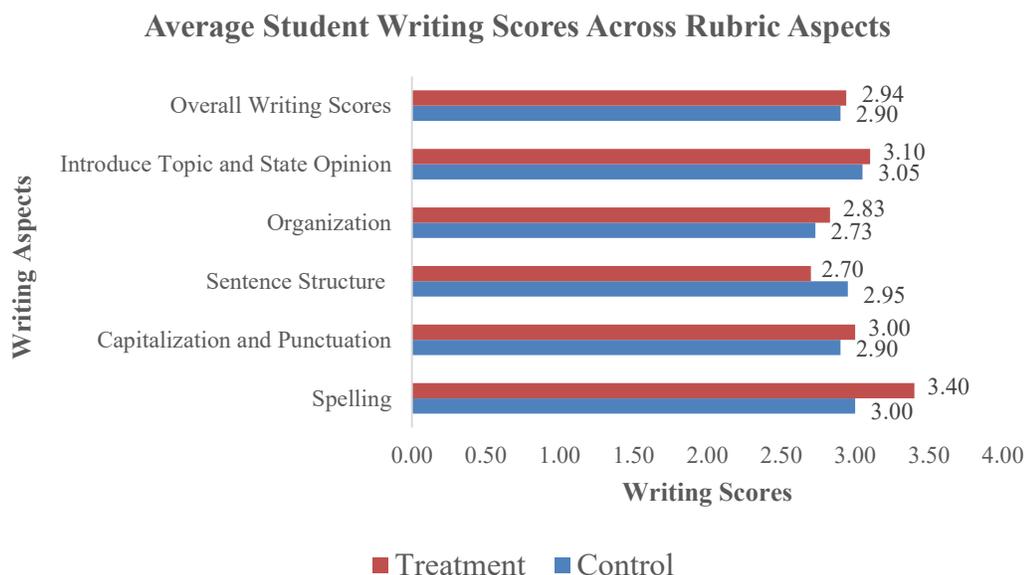


Figure 1. Average student writing scores across rubric aspects for the treatment (n = 10) and control groups (n = 10).

As Figure 1 shows, the treatment groups had higher mean scores in four aspects of the writing rubric: introducing the topic and stating the opinion, organization, capitalization and punctuation, and spelling. The aspect that had the most noticeable difference was spelling, which may be the result of students in the treatment group having access to different digital tools to help with the editing and revision process. The mean scores for the control group were higher in one aspect: sentence structure. Sentence structures refers to how students use a variety of transitional words, phrases, and clauses to link ideas and how students use a variety of sentences in their writing. Note that I chose not to compare means using inferential statistical tests as a significant finding would be unlikely given the small sample size within each group.

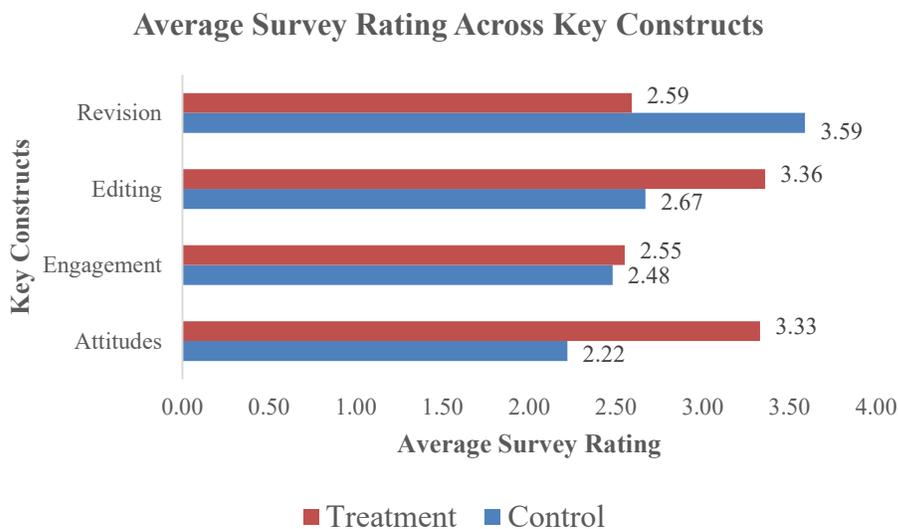
Quantitative Survey Results

After the writing unit, participants took part in a survey to explore their experiences in the writing process. Items on the survey centered around four key constructs: (1) revisions, (2) editing, (3) engagement, and (4) attitudes about writing. Revision referred to the process of identifying and resolving problems that interfere with the writer's message, such as poor organization or lack of detail by elaborating on sentences, adding more details, and changing or deleting words (Dalton & Council for Exceptional Children, 1989). Editing was the task of correcting the mechanics of writing, which include spelling, punctuation, capitalization, and grammatical mistakes (Dalton & Council for Exceptional Children, 1989). Descriptive statistics were presented to explain the average survey ratings across constructs among the treatment and control group. Means and standard deviations were calculated for each item and for each of the four constructs after first removing any responses that were rated as "Not sure / Can't answer," since these responses did not represent participants' conceptual evaluation of the item.

Appendix F displayed the survey responses for the treatment group ($n = 9$). The overall average score for revisions ($M = 2.59$, $SD = 1.15$), editing ($M = 3.36$, $SD = 1.07$), engagement ($M = 2.56$, $SD = 1.34$), and attitudes ($M = 3.33$, $SD = 1.32$) during the writing process. Appendix G displayed the survey responses for the control group ($n = 9$), displaying The average mean scores for revisions ($M = 3.59$, $SD = 0.50$), editing ($M = 2.67$, $SD = 1.35$), engagement ($M = 2.48$, $SD = 1.31$), and attitudes ($M = 2.22$, $SD = 1.39$) during the writing process. Figure 2 presented a side-by-side

comparison of the average survey rating across the four constructs between the treatment and the control group. The treatment group scored higher than the control group in the constructs of editing, engagement, and attitudes, while the control group had a higher mean score for revisions than the treatment group.

Figure 2. Average survey ratings across constructs for the control and treatment



groups.

Qualitative Survey Results

The qualitative survey results were based on participants' written responses from the open-ended survey questions. These questions focused on the successes and challenges in writing with a computer and/or with the paper and pencil method. Participants in both groups discussed their experiences with writing. Table 1 displayed the codes in participants' responses that helped identify the themes accounted for in the writing experiences.

Table 1
Themes identified from survey responses

Themes	Codes
Better or Worse Spelling	Unfinished word Spelling Spelling check Look up words Write how I thought it looked Mess up on letters
Neatness	Handwriting Shows your writing Writing neat Neat and finished Writing
Keyboarding	Don't look at fingers Type faster Does nice handwriting Keys
Distractions	Glitches Computer will not cooperate Zooming in and zooming out Pencil lead breaks Hard to eraser Hand cramps Keep on using lead Eraser getting dull Hand was hurting Not being able to erase work easily
Time	Slower in writing More time to write Faster to write
Revisions and Editing	Fix my mistakes Correct my mistakes Correct word Change the words and sentences
Formatting	Mess up paragraph

Computer Experiences

Participants who wrote using a computer were asked to share some successes and challenges regarding their writing experiences. The most relevant and salient themes that were identified in the writing experience when using a computer among the treatment group included spelling, neatness, digital distractions, and keyboarding. Table 2 displayed these themes along with a description and examples from the students' open-ended responses ($n = 9$).

Table 2
Students writing experience using a computer

Themes	Description	Examples
Better Spelling	Students described the ability to use the spell-check tool on Google Docs to fix spelling mistakes.	“Whenever I didn’t know a word, I would just write how I thought it looked like ... and it would fix my mistakes”
Neatness	The students described the ability to change the format and style of the text to create a neat-looking document.	“[computers] does nice handwriting for you”
Keyboarding	The students share their keyboarding skills (or lack thereof) which either helped or hindered their ability to produce a document in a timely manner.	“You can type faster.” “[Not] knowing where the keys are while you don’t look at your fingers.”
Digital Distractions	The students described digital distractions that involved technological issues.	“When the computer will not cooperate with me”

Across the four themes for computer experiences, the benefit of spelling words correctly was the most relevant theme identified. Five of the nine participants

in the treatment group noted that spelling was a success when using computers to write. They shared that spell-check, a digital software tool in word processors, helped them identify and correct spelling mistakes in their writing. One student explained that, “Whenever I didn't know a word, I would just write how I thought it looked like and just click on it and it would fix my mistake.” Another student stated that using “spell check [made] spelling a word easier.” The access of digital tools, like spell-check, allowed students to spell words correctly in their writing.

A second theme that was identified among the computer experiences described the affordance of neatness when using the computer to write. Neatness described the ability to change the format and style of a document to make it presentable and attractive. Students appreciated the ability to change the font style in their writing to create a presentable document. One participant mentioned that using a computer created “nice handwriting for you” while another participant stated that, “I could change the handwriting.”

Another theme shared among students was keyboarding. Students who displayed keyboarding skills were able to efficiently enter letters, numbers, and special characters on the keyboard into a word document. One student stated that, “Knowing where the keys are on the keyboard” allowed them to “type faster”. However, not all students displayed keyboarding skills. Another student noted that, “[Not] knowing where the keys are [when] you don't look at your fingers” was a challenge in their writing experience when using a computer.

In addition to keyboarding, students described digital distractions as a theme when using a computer to compose text. Responses shared among students were that computers created technology-related distractions. One student mentioned that using a computer to write was challenging when the computer was “having glitches, zooming in and zooming out by itself.” Likewise, another student added that computers are distracting “when the computer [does] not cooperate with me.” Perhaps, the computer devices were in need of an update, which resulted in technology-related distractions. However, students did not share experiences with other distractions, such as browsing the internet or exploring websites that would cause a distraction from completing the writing task. This may be due to the fact that they were being monitored during the writing unit.

Paper and Pencil Experiences

Participants in both the treatment and control group were asked to share some successes and challenges about the writing experience using the paper and pencil method. Though participants in the treatment group did not use the paper and pencil method in the study, they all have had prior experiences with writing using the paper and pencil method in their educational setting. Participants described distractions, revisions and editing, neatness, time, worse spelling, and formatting as themes they experienced during the writing process. Table 3 displayed these themes along with a description and examples from the students’ open-ended responses ($n = 17$).

Table 3
Students writing experience using the paper and pencil method

Theme	Description	Examples
Distractions	The students described distractions when writing that may prevent students from giving their full attention to the writing task.	“When I erase in the same spot, it usually rips and I’ll have to get a new paper and rewrite my whole essay.”
Revisions and Editing	The students described opportunities and challenges with revising and editing their paper using paper and pencil.	“Not being able to erase my work easily.”
Neatness	The students described their penmanship and how that played a role in creating or hindering a presentable, legible, and/or attractive paper.	“I like my handwriting.” “Sloppy handwriting”
Time	The students explained how the time it took to write their paper was determined by the speed of their writing with paper and pencil.	“I write faster on paper and pencil” “It takes more time to write”
Worse Spelling	The students described the tendency to make spelling mistakes when writing.	“Misspelling a word”
Formatting	The student described the opportunity that a document can be more easily formatted or organized in the paper and pencil format.	“Computers are sometimes hard to control... for example when trying to write a title you mess up the paragraph and [on] paper it’s easier to put the title and [insert] the words in the paragraph”

In regards to writing using the paper and pencil method, a common theme identified among 11 out of the 17 participants in the survey was the distractions that did and did not occur when writing that may have prevented them from being fully engaged in the writing task. A list of distractions shared among these participants included: hand cramps, pencil lead breaking easily, erasers getting dull, difficulties erasing pencil marks, and doodling on paper. One student noted that “My hand was hurting,” while another student shared that his or her “pencil lead breaks easily” so there was a need to “keep on using [more] lead.” On the other hand, some students shared how writing with a paper and pencil did not cause distractions related to technology. One student noted that, “Your work doesn’t freeze up” while another student appreciated “not having [technology] glitches” when writing on paper versus writing on the computer.

A second theme identified was the process of revising and editing work during the writing unit. One student described writing with a paper and pencil to be “easier to change the words and sentences.” Another student explained how it was “somewhat easy to go back and fix my mistakes when I needed to.” These students may have appreciated the ability to physically fix their mistakes on their paper as opposed to doing so digitally. However, other students noted the challenges during the revision and editing process. One student expressed “not being able to erase my work easily.” This student may have preferred the ability to select a set of words or sentences on Google Docs to be able to delete with just one click on the keyboard.

Participants also described neatness as a theme that occurred when writing using a paper and pencil method. The students described their penmanship and how that played a role in creating or hindering a presentable, legible, and/or attractive paper. Some students reported that physically writing a paper allowed them to show their neat, nice handwriting when finished. One student stated that “I like my handwriting,” while another student shared that, “It actually shows your writing.” This suggested that the personalization of one’s own handwriting can be motivating for some students as they take pride in their own work as demonstrated by their neat handwriting. Other students explained challenges with penmanship. Having “sloppy” or “bad handwriting” caused difficulties in creating a neat-looking paper, as it may have been hard to read.

The time it took to write a paper was another theme identified among the participants. For students who enjoyed writing using a paper and pencil, they were successful in writing an essay in a timely manner. One student expressed how it was faster to write than to type. This may be due to the lack of exposure this student had in keyboarding. Yet, other students noted how physically writing a paper was more challenging because “it took more time to write” or that they were “slower in writing.” Perhaps the exposure of using computer devices and possessing keyboarding skills may have played a role in how students responded to writing on paper and pencil.

Next, students described having worse spelling as a theme that was identified in the paper and pencil experience. Students who participated in the survey noted the

tendency of making spelling mistakes when using the paper and pencil method to write. They had difficulties in “misspelling word[s]” and “messaging up on letters”. One student did not enjoy “[having] to use the [physically] dictionary to look up words.” Without access to digital tools that can assist students with spelling, these students seemed to struggle being able to spell correctly.

An interesting theme worth highlighting for one student was the ease of formatting a paper, which refers to the way a document is laid out in terms of organization. The student described the opportunity that a document can be more easily formatted or organized by sharing that, “Computers are sometimes hard to control... for example when trying to write a title you mess up the paragraph and [on] paper it’s easier to put the title and [insert] the words in the paragraph.” Using a paper and pencil to write allowed for the writer to be able to control the placement of words and paragraphs without causing a distraction.

Summary

This chapter presented results regarding participants’ writing performance scores, survey ratings, and open-ended survey responses. The results provided insights into how the writing experience differed for students who composed text via Google Docs versus traditional writing with paper and pencil.

Results of the writing rubric performance scores indicated that the treatment group had a nominally higher overall mean score than the control group, although statistical comparisons of mean scores were not conducted. More specifically, the treatment group slightly outperformed the control group in the aspects of the rubric

for introduction, organization, capitalization and punctuation, and spelling. On the other hand, the control group had a higher average score than the treatment group on the sentence structure component of the rubric.

Data from the survey responses revealed that the control group revised their writing more often than the treatment group. However, the treatment group edited their writing more often than the control group. This may be due to the fact that students had access to digital writing tools, such as spell-check, voice-to-text, an online dictionary and thesaurus. In addition, the treatment group had higher levels of engagement and more positive attitudes in writing than the control group. The access of having digital writing tools, such as spell-check, during the writing process may have influenced the engagement and attitudes about writing when using a computer.

For participants who wrote using a computer, data from the open-ended responses from the survey revealed four themes about their writing experience. First, computers provided opportunities for better spelling through the use of the spell-check tool. Next, students who used the computer to type their essays appreciated the ability to create a neat-looking document. In addition, students shared how their keyboarding skills either helped or hindered their ability to produce a document in a timely manner. Lastly, computers created digital distractions for some students.

More themes were revealed as the writing experiences of students using the paper and pencil method were shared. First, students described distractions that occurred when writing using a paper and pencil. Second, opportunities and challenges were identified when revising and editing written work. Participants also shared how

penmanship was important in determining whether papers were presentable, legible, and/or attractive. Another theme related to time explained how the time it took to write an essay varied depending on the participant's hand-writing skills. Furthermore, participants had the tendency of making spelling mistakes more frequently using the paper and pencil method. Finally, the ease of formatting a paper was the last theme that was important to highlight from the survey responses.

CHAPTER V

DISCUSSION

This study explored the writing performance scores and writing experiences of fifth grade students using Google Docs with students who used the paper and pencil method. Writing performance scores were assessed using a district-created rubric and students' writing experiences were shared on a survey with items and open-ended prompts that centered around key constructs of the literature review. This chapter will discuss the findings related to the following research questions:

1. According to writing rubric performance scores, how do writing scores compare for students who compose text via Google Docs versus traditional writing with paper and pencil?
2. According to student survey responses, how does the writing experience differ for students who compose text via Google Docs versus traditional writing with paper and pencil?

Additionally, the implications and limitations of this study and the need for further areas of research are presented.

Discussion

The findings from this study indicate that writing performance scores across both groups were for the most part similar. Regardless of if students used a computer to compose text or wrote using the paper and pencil method, the writing score between the two comparable groups did not show significant differences. Though

students who wrote using a computer had a slightly higher overall mean score, it was not as pronounced as past research has suggested (Suwantarathip & Wichadhee, 2014). In the present study, the students who generally produced good writing were able to continue to do so, regardless of the group they were in. Composing a text using either method did not create a challenge. However, students who struggle in writing continued to face challenges when composing text. Even with a good plan and idea, the lack of knowledge about proper sentence structure and syntax can impede students from creating fluid and elaborate text (Dunn & Finley, 2010). Though digital editing tools, such as spell-check, can help students improve on their writing scores, they still need further instruction and practice with other aspects of writing, such as how to introducing a topic, organizing and group ideas into logically ordered paragraphs using reasons and evidence, and using a variety of sentence structures, transitional words and phrases, and correctly using grammar.

I also found it interesting that regardless of the method students used to compose text, their writing preferences played a role in their writing experience. While some students had positive experiences during the writing unit, others did not. The ability to utilize computer literacy skills, such as keyboarding skills and the knowledge of the functions and tools in Google Docs may have influenced the experiences of those who wrote using the computer. The same applied for students in the paper and pencil method, as some took pride in their own hand written work. In the current study, students who did not have a positive experience in the writing unit could have felt restricted in their ability to use their preferred method and tools of

writing with which they are comfortable. This finding is similar to that of Ambrose and Palpanathan's (2017) findings which explained how students' performance varied depending on how they perceived Google Docs compared to other writing mediums.

Implications

This study has a variety of implications for students, educators, school and district leaders, as well as scholars in the field of Educational Technology.

Stakeholders may be unsure of how technology integration may influence elementary students' writing. They may wonder if the use of a word-processor, such as Google Docs, can help students improve on their writing abilities, engagement, and attitudes about writing. With expectations for technology integration becoming increasingly more common in classrooms today, it is important to consider the results of this study to understand the effects of using Google Docs on student writing. Considering the findings from the current study, I have three suggestions that follows:

First, I caution stakeholders who adopt a technology enthusiast viewpoint. Though there is mounting evidence according to Dwyer (1996) showing that technology improves writing and engagement in schools among students, educators should not assume that integrating technology will create better writers among students. Instead, the focus on the cognitive process theory of writing, developed by Flower and Hayes (1981) is an integral part of writing that needs to be taught before introducing students to a word-processor application. Educators should teach students that writing consisted of revisiting steps in the writing process which include: brainstorming and prewriting, drafting, revising, and editing, before publishing.

Second, teachers should design learning experiences around writing that provides students with more opportunities to write using a variety of writing mediums. There needs to be more frequent, short writing sessions where students are able to compose, revise, and edit their work which will allow students to be successful in the writing process (Dalton & Council for Exceptional Children, 1989). Implications from the findings support the use of a word processing application in writing for students who prefer to write using the computer. However, stakeholders should understand the value of providing students with options when writing. While some may prefer to compose text using a computer, others may perform much better and have positive attitudes with writing when using the traditional paper and pencil method.

Finally, a call for more professional development to support teachers in teaching students technology skills, how to develop strategies, and operate digital tools may help students in writing. As a researcher and the principal investigator of this study, I had proficient knowledge with Google Docs, so I was able to provide a great deal of scaffolding for my students with these technology skills. By offering more professional development on how to take advantage of the digital tools available in word processing applications, the writing process may be more engaging and effective among students. As teachers, a combination of good writing instruction, technology integration, and ongoing assessment of students' needs can make the writing process more engaging (Dalton & Council for Exceptional Children, 1989). By understanding Flower & Hayes' (1981) cognitive process theory of writing and

how to differentiate among students based on their writing abilities, needs, and preferences using the digital tools and resources available, writing may be less challenging, which may result in more engagement and positive attitudes among students about the writing process.

Limitations

The current study, like all research studies, had limitations presented by the study design. One limitation in this study was the small sample size. Out of the 26 total students in my class, 20 students participated in the study. Parents and students who chose not to have their child or themselves participate in this study may have forgotten to sign the consent form in a timely manner, lost the paper, or simply chose to opt out.

I chose to divide the 20 students who elected to participate in the study through convenience sampling. The use of convenience sampling may introduce bias because participants are not selected at random, and therefore the results cannot be generalized to an entire population (Merriam, 2009). Nonetheless, using convenience sampling allowed me to choose a sample population that was feasible for me as a researcher and classroom teacher (Taherdoost, 2016). I then used the stratified sampling method to divide the 20 participants into two comparable groups. The purpose of using the stratified sampling method was to ensure that the subgroups were equally represented (Taherdoost, 2016). This was a way to reduce sampling error that could be presented due to a small sample size. Lastly, I used random

assignment in the form of a coin-toss to determine which group was the treatment group and which group was the control group. Though some participants may have had a preference of being in one of the two groups, using random sampling helped avoid selection bias and provided everyone an equal chance of being in either the treatment or control group (Allen, 2017). By sampling my own students in the Central Valley of California, the sample used in this study does not represent the entire population of elementary students. However, this was an authentic study that explored the writing scores and experiences among students who compose text using *Google Docs* with students who wrote using the paper and pencil method in my fifth grade class. While the findings may not be generalizable, it may be useful to educators seeking to explore writing in a similar context.

Another limitation to this study was that it was conducted at the end of the school year. However, by using the mixed methods design and a triangulation of data sources in this study, I was able to collect and combine quantitative and qualitative data concurrently during the study to develop a more complete understanding of social phenomena (Creswell & Plano Clark, 2010). Since I had two different, but related questions, using the mixed method approach provided me useful information about the outcomes of students writing scores, but also helped me develop a more-in depth understanding of the writing experiences using a particular approach. The writing unit was three weeks long, which was enough time to complete the writing task and the study. However, if more time was allotted for the writing unit, scores may have been different as I, the teacher, could have spent more time on a particular

activity or revisited a skill that needed further teaching. In addition, students may often feel burnt out and ready for summer vacation. Thus, it is possible that some students may not have given their best effort in the writing unit.

Finally, a limitation of this work was the missed opportunity to observe students' behavior and interaction with their text over the three-week writing unit. Observations could have been conducted during the five steps of the writing process as described by Flower and Hayes (1981) to determine some of the opportunities and challenges encountered during the writing unit. Though some qualitative data were gathered from the survey responses, adding teacher observations may help confirm and/or expand upon the themes identified from the open-ended survey questions.

Further Research

Comparing students' writing using Google Docs with the traditional paper and pencil method yielded inconsistent results with that of the literature review. Thus, more research on this topic would be beneficial to help further understand the relationship between using a word processor and writing. I would suggest further research studies to explore more quantitative data with a larger sample size so that the results can be more generalized. In addition, conducting a year-long, longitudinal study encompassing multiple writing topics and genres may be more effective in understanding the relationship between writing and technology. To add, a follow up study that observes how students interact with their paper during the revision and editing process, how they were engaged in the writing task, and their attitudes during the process may help deepen the understanding of students' performance and

experiences in the writing unit. Lastly, the survey given in this study could be explored at a school-wide or district level to see the results at a larger scale. As students and educators continue to become more familiar and comfortable with using computers in the classroom, students' writing performance scores and writing experience may be different than that of this study. It may be suggested that using a word processor should be implemented in the classroom more consistently depending on students' computer literacy skills and writing abilities.

Summary

The purpose of this study was to examine how writing scores and experiences compare for students who compose text via Google Docs versus traditional writing with paper and pencil. The fifth-grade participants in this study completed a three-week writing unit and produced a multi-paragraph opinion essay that was assessed. Participants then took part in a post survey to share their experiences, successes, and challenges in writing with their assigned writing medium. The treatment group had a nominally higher overall mean score than the control group, with writing performance scores looking quite similar across both groups. Data from the survey responses revealed that the treatment group edited their writing more often than the control group and that they had higher levels of engagement and more positive attitudes in writing than the control group. However, interestingly, the control group revised their writing more often than the treatment group. Themes from the open-ended responses centered around the ideas of distractions, neatness, and spelling, with students citing pros and cons for both writing with paper and pencil and a computer. It is also

important to note that regardless of the method students used to compose text, their writing preferences played a role in their writing experience.

In sum, I conclude that elementary students may benefit from writing experiences that utilize both the paper and pencil and computer mediums for composing text, since students seem to experience advantages and disadvantages with both mediums. While technologies like *Google Docs* offering a number of potential learning affordances, low technology options like writing with a paper and pencil likely also offer learning affordances that should not be discounted in the 21st century classroom. As 1:1 initiatives proliferate, school and district stakeholders should remember that more technology is not always the best way to support students. As Dwyer (1996) suggests, educators should take risks when integrating technology in the classroom by conducting trials and errors, and critique the results, to determine how to use technology effectively in our classrooms today.

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APPENDICES

APPENDIX A
PRINCIPAL CONSENT



1530 Mt. Vernon Drive,
Modesto, CA 95350
Principal: Ignacio Cantu

To Whom It May Concern:

I, Ignacio Cantu Jr., am aware of the research study conducted by Letta Ka. I understand that the involvement of our students in assisting Mrs. Ka in her study will be used for the purpose of completing her Masters with CSU Stanislaus. I have read through her research proposal and support the involvement of our students in her study.

I do ask that the name of our school and the names of our students be kept confidential.

Thank you,

A handwritten signature in black ink that reads "Ignacio Cantu Jr." in a cursive script.

Ignacio Cantu Jr.
Principal
Email: Cantu.i@monet.k12.ca.us
Phone; (209) 574-1992

APPENDIX B

PARENTAL CONSENT FORM

Purpose of the Research

The Principal Investigator, Letta Ka, is a student at California State University, Stanislaus conducting research for a master's degree in Education Curriculum and Instruction with an emphasis on Educational Technology.

The purpose of this research is to compare students' writing scores and writing experiences when using *Google Docs* to compose text versus the traditional paper and pencil method. Your child is invited to take part in this research.

Procedures

If you agree to let your child participate in this research, the following will occur:

- Your child will participate in a writing unit in his/her 5th grade classroom. He/She will complete a multi-paragraph opinion essay using a paper and pencil or a word-processing software known as *Google Docs*. Lessons will be broken down into 5 main parts: prewriting, writing, revision, editing, and publishing. Thirty minutes will be spent each day on the writing unit.
- Written work will be assessed by two teachers using a district-created grade 5 opinion writing rubric to examine student writing performance scores.
- At the end of the writing unit, your child will complete an online survey that asks him/her to reflect on the writing experience. The survey will take approximately 10 minutes to complete.
- A total of 3 weeks will be committed for this writing unit.

Potential Risks or Discomforts

Although there are no known risks for your child to participate in this study, minimal stress can occur for students who are challenged with the task of completing a multi-paragraph essay. To minimize the potential risks, the teacher plans on providing support and guidance throughout the writing process. The writing unit used in this study is typical of writing units used in the past as a 5th grade teacher and is similar to units used by other 5th grade teachers.

Potential Benefits of the Research

Information gathered may help educational leaders make informed decisions regarding the implementation of computer devices in the educational setting. By understanding the relationship between technology and writing, it will help educators plan curriculum, lessons, and instructional strategies that will be most beneficial for students to demonstrate proficiency in writing. Educators may become more knowledgeable as to which instructional tools to incorporate in writing activities

across all curriculum, providing students with learning opportunities to reach college, career, and life readiness.

Confidentiality

Data collected by the researcher will be kept confidential in a secure location and in a password protected computer. The researcher will be the only person who will have access to any data that can be linked to individual participants.

The researcher **will not** keep your child's research data to use for future research or another purpose.

Costs

There is no cost to your child beyond the time and effort required to complete the procedure(s) listed above.

Compensation

There will be no compensation for participating in this research. There is no anticipated commercial profit related to this research.

Participation and Withdrawal

Your child's participation is voluntary. He/She may refuse to participate or stop participation at any time without penalty or loss of benefits.

Questions

If you have any questions about this research, you may contact me, **Letta Ka**, at **(209) 574-1992** or my faculty sponsor, **Catharyn Shelton** at **209-667-3495** or **cshelton1@csustan.edu**. If you have any questions regarding your child's rights and participation as a research subject, please contact the IRB Administrator by phone (209) 667-3493 or email IRBadmin@csustan.edu.

Consent

I have read and understand the information provided above. All of my questions, if any, have been answered to my satisfaction. I consent to allow my child to participate in this research. I have been given a copy of this form.

Please check one of the following and complete the information below:

I give consent to have my child participate in this study.

I do not give consent to have my child participate in this study.

Parent/Guardian Signature: _____ Date _____

Parent/Guardian Name (printed): _____

Child's Name (printed): _____

APPENDIX C

CHILD ASSENT FORM

Dear Student,

I am doing a study to learn about students' writing scores and their experiences in writing when using *Google Docs* versus the traditional paper and pencil method. The research will take place in our classroom.

You will be working on a writing unit that is similar to other 5th grade writing units in class. You will complete a multi-paragraph opinion essay using a paper and pencil or on *Google Docs*. If you agree to be in this study, you will complete an online survey that asks you to reflect on the writing experience.

If you agree to participate in this study, it means that you are allowing me to use your information from the writing unit in my research. If you do not agree to participate in this study, I will not use your information from the writing unit in my research.

Students who decide to participate and those who decide not to participate will complete the same writing unit in class.

You can ask questions about this study at any time. Being in the study is up to you, and no one will be upset if you don't not agree to participate or if you change your mind later. If you have any questions please contact me, Mrs. Letta Ka, at 209-574-1992 or my faculty sponsor, Catharyn Shelton at 209-667-3495 or cskelton1@csustan.edu. If you have any questions regarding your rights and participation as a research participant, contact the IRB Administrator by phone (209) 667-3493 or email IRBAdmin@csustan.edu.

Sincerely,
Mrs. Letta Ka

Consent:

I have read and understand the information above. All of my questions have been answered. I assent to take part in this study. I have been given a copy of this form.

Please check one of the following and complete the information below:

I agree to participate in this study.

I do not agree to participate in this study.

Participant/Student Signature: _____ Date: _____

Participating/Student's Name (Printed): _____

APPENDIX D

DAILY ACTIVITIES OF THE WRITING UNIT

Day	Student Activity
1	Students distinguished between opinions and reasons and identified and sorted out reasons and supporting details.
2	Students identified the basic elements of an opinion essay, looked at an example of a multi-paragraph opinion essay, and color-coded each element.
3	As a class, students read and discussed a 1-page grade-level appropriate debate article about whether students learn a foreign language?
4	Students were given time to write freely about the topic: <i>Should Students Learn a Foreign Language in School?</i> They were instructed to not focus on the language, content, or conventions of writing, but instead to brainstorm a list of reasons to support their opinion. This is the first step in the writing process as mentioned in Flower and Hayes' (1981) cognitive process theory of writing.
5	Students created a title, decided on an opinion about the topic, and wrote a draft topic sentence that stated their opinion on an informal outline. This was the beginning stages of the drafting process, mentioned in the cognitive process theory of writing (Flower & Hayes, 1981).
6	Students continue working on their introduction by adding a <i>plan sentence</i> . The <i>plan sentence</i> included the key ideas, which are the reasons supporting the writer's opinion.
7	Students created a visual plan by drawing boxes for each paragraph that was part of the essay and jotted down words or phrases in each box to describe the content of the paragraph. This step is called "blocking out" in the <i>Step Up to Writing (SUTW)</i> curriculum and relates to students setting goals. Creating a visual plan allowed students to set goals to complete the writing task, which is an important part of the cognitive process theory of writing (Flower & Hayes, 1981).
8	On the informal outline, students organized their ideas and information. They focused on the body paragraphs and elaborated on their reasons using supporting details by referring back to their visual plan. This process consisted of the higher-order level of organization that Flower & Hayes (1981) described in the cognitive process theory of writing.

- 9 Students chose transitional phrases and linking words to introduce new reasons and show how the reasons and supporting details are connected.
 - 10 Continuing with the outline, students focused on the conclusion by restating their opinion and wrapping up their ideas in a conveying way.
 - 11 With a completed informal outline, students wrote their first draft.
 - 12 Students revised their first draft by looking for ways to improve the ideas and content, sentence variety, and vocabulary. They made sure their reasons were organized in a way that made sense. By understanding that writing was not a linear process, but instead a process in which steps are revisiting, students were using practicing the cognitive process theory of writing by Flower & Hayes (1981). Students with 1:1 devices used the digital tools on Google Docs to revise their work.
 - 13 Students edited their essay using the *CUPS* checklist from the *SUTW* curriculum by looking at the capitalization, usage, punctuation, and spelling in their writing, which related to the editing step in the writing process mentioned by Flower and Hayes (1981). The students with 1:1 devices used digital tools, such as spell-check, the online dictionary, grammatical suggestions, and autocorrect to edit their work.
 - 14 Students created a final copy of their essay.
 - 15 Students proofread their essay by checking the formatting (e.g. margins, title, indentations, etc.) and other errors, such as repeated or missing words, typos, and extra or missing spaces. The final copy of their multi-paragraph opinion essay was submitted on this day.
 - 16 The post survey was administered to students.
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APPENDIX E
WRITING RUBRIC

Grade 5 Opinion Writing Rubric				
	4 Exceeds Expectations	3 Meets Expectations	2 Progressing Towards Expectations	1 Below Expectations
Introduces a topic and states opinion	Effectively introduces the topic/text in an interesting way.	Introduces the topic/text.	Attempts to introduce the topic/text.	Does not introduce the topic/text.
	Effectively states an opinion that demonstrates an insightful understanding of the topic/text.	States an opinion that demonstrates an understanding of the topic/text.	States an unclear opinion on a topic/text.	Does not state an opinion
Organization	Effectively provides logically ordered reasons and relevant evidence (facts and details) using credible sources that support an opinion.	Provides logically ordered reasons to support an opinion using facts and details.	Provides a few reasons to support an opinion using facts or details.	Does not provide reasons to support an opinion.
	Effectively groups ideas and information into logical paragraphs using a formal writing style.	Groups ideas and information into logical introductory, body, and concluding paragraphs.	Attempts to group ideas and information into paragraphs.	Does not group ideas and information.
Sentence Structure	Effectively provides an insightful concluding statement or section that strongly supports writer's opinion.	Provides a concluding statement or section related to the opinion presented.	Provides an unclear concluding statement or section.	Does not provide a concluding statement or section.
	Effectively using a variety of transitional words, phrases, and clauses to clarify the relationship between opinion and reasons.	Uses a variety of transition words, phrases and clauses to link opinion and reasons.	Uses few transition words, phrases, and clauses to link opinion and reasons.	Does not use transitional words, phrases, and clauses to link opinions and reasons.
	Effectively uses a variety of sentence structures.	Uses a variety of sentence structures with few errors .	Little use of sentence variety.	Do not use a variety of sentences.
Capitalization and Punctuation	Correct use of capitalization and punctuation.	Correct use of capitalization and punctuation with few errors .	Inconsistent use of capitalization and punctuation.	Capitalization and punctuation errors are frequent and severe .
Spelling	Correctly spells grade level words.	Spells grade level words with few errors .	Inconsistent spelling of grade level words may obscure meaning.	Meaning is often obscure.

APPENDIX F

SURVEY RESPONSES FOR TREATMENT GROUP

Item	Often 4	Sometimes 3	Rarely 2	Never 1	Not sure or can't answer	<i>N</i>	<i>M</i>	<i>SD</i>
Revisions								
I changed my sentences to be longer and more detailed.	2	5	1	0	1	8	2.78	1.43
I rewrote my sentences by fixing my grammatical mistakes, such as the use of nouns, pronouns, verbs, and adjectives.	1	4	3	0	1	8	2.44	1.32
I changed the words in my paper as I wrote.	1	6	0	1	1	8	2.56	1.42
Editing								
I saved different copies of my drafts as I wrote.	0	3	1	5	0	9	1.78	0.97

Using a computer to write made it easier for me to find mistakes in my writing.	7	2	0	0	0	9	3.78	0.44
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Using a computer to write made it easier for me to add, change, and/or delete text.	9	0	0	0	0	9	4	0
---	---	---	---	---	---	---	---	---

Using a computer to write made it easier to create a neat-looking document.	8	1	0	0	0	9	3.89	0.33
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Engagement

I was more involved when using a computer to write than when I write with paper and pencil.	4	4	1	0	0	9	3.33	0.71
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I got more distracted using a computer to write than when I write with paper and pencil.	0	0	2	7	0	9	1.22	0.44
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I felt more motivated using a computer to write than when I write with paper and pencil	6	2	0	0	1	9	3.11	1.45
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Attitudes

I prefer using a computer to write more than writing with paper and pencil.	6	2	0	0	1	8	3.33	1.32
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APPENDIX G

SURVEY RESPONSE FOR CONTROL GROUP

Item	Often 4	Sometimes 3	Rarely 2	Never 1	Not sure or can't answer 0	<i>N</i>	<i>M</i>	<i>SD</i>
Revisions								
I changed my sentences to be longer and more detailed.	5	4	0	0	0	9	3.56	0.53
I rewrote my sentences by fixing my grammatical mistakes, such as the use of nouns, pronouns, verbs, and adjectives.	5	4	0	0	0	9	3.56	0.53
I changed the words in my paper as I wrote.	6	3	0	0	0	9	3.67	0.50
Editing								
I saved different copies of my drafts	7	2	0	0	0	9	3.78	0.44

as I wrote.

Using paper and pencil to write made it easier for me to find mistakes in my writing, compared to using a computer to write.	3	2	0	3	1	8	2.33	1.58
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Using paper and pencil to write made it easier for me to add, change, and/or delete text, compared to using a computer to write.	3	1	1	4	0	9	2.33	1.41
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Using paper and pencil to write made it easier to create a neat-looking document, compared to using a computer.	2	1	3	3	0	9	2.22	1.20
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Engagement

I got more distracted using paper and pencil to write compared to when I write with a computer.	2	2	2	2	1	8	2.22	1.39
I was more involved when using paper and pencil to write than when I write with a computer.	4	2	1	2	0	9	2.89	1.27
I felt more motivated using paper and pencil to write than when I write with a computer.	3	0	3	3	0	9	2.33	1.32
<hr/>								
Attitudes								
<hr/>								
I prefer using a paper and pencil to write more than a computer.	3	0	2	4	0	9	2.22	1.39
<hr/>								