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ELEMENTARY STUDENTS USE VOICE-TO-TEXT TO WRITE

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ELEMENTARY STUDENTS USE VOICE-TO-TEXT TO WRITE

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This dissertation is dedicated to my husband, Ben Fudickar, and two daughters, Abby Ruth Fudickar and Emma Ann Fudickar. Throughout this journey, you have shown me love and patience, and given me an abundant amount of grace. Ben, you stepped in when I was unavailable; and girls, you both gave me encouragement during the times of greatest need. Thank you for supporting one of my dreams. I love you! It is my hope that you learned from my journey. Always remember, hard work and perseverance yields some of life's greatest rewards.

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Abstract

Using qualitative methods and a multiple-case study design, this study explored how four students in elementary school, with poor writing skills, poor handwriting skills, or a reluctant writer, responded to using voice-to-text (e.g., Google Voice Typing) to compose. Data were derived from semi-structured interviews, observations, documents, and audiovisuals. The study concluded that participants liked using Google Voice Typing to compose because it allowed them to think and say words quicker than handwriting words; helped with not forgetting what to say; made writing easier; and produced better compositions. Reasons participants gave for not liking Google Voice Typing to compose included: difficulty with editing, having to dictate the punctuation while composing, and when Google Voice Typing misrecognized their dictations. Compared to handwritten compositions, Google Voice Typing produced compositions with more words and more words per minute on rough drafts, more words and paragraphs in final drafts, a variety of sentences, fewer errors in conventions, and neater publications. Google Voice Typing eliminated the need to rewrite a final draft. Using a narrative guide impacted the time spent planning. Prewriting and editing were easier when handwriting; and drafting, revising, and publishing were easier with Google Voice Typing. Recommendations are made for giving children the optimal mix of writing conditions based on each phase of the writing process, how to use Google Voice Typing with the 6+*1* Traits of Writing, and how to train children to use Google Voice Typing.

Chapter 1: Introduction

"Writing is not a McDonald's hamburger," reveals Goldberg (2005). "The cooking is slow, and in the beginning you are not sure whether a roast or a banquet or a lamb chop will be the result" (p. 41). Yet, many novice writers settle for a "McDonald's hamburger." It comes quickly and easily, without much effort. On the contrary, proficient writing takes time to develop and requires one to read, listen, and practice continuously. Maybe this is what makes writing so difficult for some.

Or could the difficulty lie with the task of getting a thought down on paper? At times, barriers get in the way of young writers becoming proficient writers. For example, poor handwriting or poor writing skills may limit some young writers. Whatever the reason, many young writers find writing to be difficult, and give up before they have a chance to develop. Perhaps, if young writers realized that not even professional writers create the perfect first draft, but work with multiple drafts that eventually come to full fruition, they would not give up so easily. After all, "…writing is thinking and…it's never easy, always messy, yet ultimately satisfying…" (Culham, 2014, p. 13).

Problem Statement

The National Center for Education Statistics (2012) released *The National Report Card: Writing 2011* in the fall of 2012. The results for writing were somewhat alarming: 20% of 8th graders performed below the basic level; 54% of 8th graders performed at the basic level (partial mastery of the prerequisite knowledge and skills); 24% of 8th graders performed at the proficient level (solid academic performance); and 3% of 8th graders performed at the advanced level (superior performance). Almost 75%

of 8th grade students could not "clearly demonstrate the ability to accomplish the communicative purpose of their writing" (National Center for Education Statistics, 2012, p. 1). That is to say, these students were unable to communicate their ideas coherently and efficiently. Why does this matter? To begin with, it matters because:

> Writing helps students become better readers and thinkers. It can help students reflect critically about the information and ideas they must understand and make use of both in academia and in the world outside its doors. It can improve achievement in school and in the professions students aspire to. It supports their growth as adult independent thinkers. Writing is a gateway to students' emerging role in our nation's future as participants and decision makers in a democratic society. (National Writing Project & Nagin, 2006, p. 104)

Hillocks elaborates, "Students must 'learn to be inquirers, experimenters, and problem solvers'…not only to become more effective writers and readers but to become more fully participating citizens in a rapidly changing world" (as cited in National Writing Project & Nagin, 2006, p. 73). But most importantly, writing matters because of "how powerful it can be when children put into print their view of the world" (Calkins, 1983, p. vi).

In response to these results, exploring new methods of teaching writing could benefit students. For instance, what role could new technologies play in writing instruction? The National Writing Project & Nagin (2006) assert, "All aspects of a writer's work in and out of the classroom—prewriting, drafting, revision, editing, and eventual publication—have been advanced by the introduction of technology" (p. 29). Perhaps using technology to write could make the writing process less challenging and

more enjoyable for students, empowering them to become proficient writers (Fudickar, 2017).

Significance of the Study

It is important to understand the impact technology has on children. The advancement of digital media over the last decade has created a sense of being constantly connected or attached to technology. 8- to 12-year olds are accustomed to being plugged-in to entertainment media (e.g. TV, mobile games, Internet, etc.) an average of about six hours a day (Common Sense, 2015). Hicks (2013) proclaims, "The question is no longer whether we *should* use technology to teach writing; instead we must focus on the many ways that we *must* use technology to teach writing" (p. 2).

Writing requires children to engage in a variety of cognitive processes, such as creating ideas, translating ideas into language, and recording the language on paper (transcription). At times, children find the transcription process challenging. It requires significant expenditures of the child's working memory, which can interfere with other cognitive processes (De La Paz, 1999). In the time between thought and written word, ideas may be lost or momentum halted. Voice-to-text technology takes the user's spoken words and transforms the words into written text. This could be a helpful and appealing tool for children. Voice-to-text technology allows children to dictate text orally to a computer, easing transcription load, and freeing up working memory.

The two most common methods for accessing voice-to-text technologies are built-in speech recognition (SR) software and purchased SR software (e.g., Dragon) downloaded or installed on computers, tablets, and mobile devises. SR software can be used to help less fluent writers, students with learning disabilities, and students with

Asperger's syndrome. A few studies have found that when students used SR software to write, writing skills improved, length of writing increased, surface errors decreased, and writing was overall better quality (MacArthur & Cavalier, 2004; Schneider, Codding, & Tryon, 2013; Quinlan, 2004; Wetzel, 1996).

Despite great leaps in technology, relatively few studies of voice-to-text as a way to compose have been done (Schneider et al., 2013).

Research Purpose/Research Questions

The purpose of this qualitative case study was to gain insight into how elementary age students responded to using voice-to-text to compose. The research questions that guided this study included:

- How did students respond to using voice-to-text as a method of composing?

- What effect, if any, did voice-to-text have on the content, appearance, or other features of compositions?

- How did voice-to-text change the composing process for students?

Chapter 2: Literature Review

In the 1950's, a shift occurred in psychology, from behaviorism to a cognitive perspective. Cognitive psychologists tend to be concerned with what learners know and how they acquire knowledge (Jonassen, 1991). "The overall aim of cognitive research is to contribute to an understanding of human performance, learning and development, and individual differences by analyzing thinking or cognitive processes" (MacArthur & Graham, 2016, p. 25).

Jerome Bruner was a pioneer of the cognitive revolution. His role began at Harvard University in 1951 when he and his colleagues "sought to describe and in a small measure to explain what happens when an intelligent human being seeks to sort the environment into significant classes of events so that he may end by treating discriminably different things as equivalents" (Bruner, Goodnow, & Austin, 1956, p. viii). As participants solved problems, they used a think aloud strategy, meaning they explained out loud their thinking while working through a task. In order to understand what participants were thinking, Bruner et al. (1956) analyzed the strategies participants shared aloud as they solved problems.

Bruner (1963) believed "…that any subject can be taught effectively in some intellectually honest form to any child at any stage of development" (p. 33). Building in difficulty, curriculum begins with a new concept, spirals to revision, and eventually culminates in mastery. Bruner (1963) explained it as a "…spiral curriculum that turns back on itself at higher levels…" (p. 13). Additionally, Bruner postulated that learning has three processes: acquisition (getting facts), transformation (manipulating facts), and evaluation (checking ideas). When learning any subject, there are episodes (brief or

long) that involve these three processes, which contain many ideas or a few (Bruner, 1963).

Next, Bruner (1966) presented the three learning modes of representation: enactive or physical (learn through movement or action), iconic or visual (learn through images or icons), and symbolic or language (learn through abstract symbols). The learning modes are "how the child gets free of present stimuli and conserves past experience in a model, and the rules that govern storage and retrieval of information from this model" (Bruner, 1966, p. 10). Learning modes are not age-dependent and are applicable to both children and adults, unlike Piaget's stages of development.

Lastly, in his later years, Bruner aligned himself to a psycho-cultural approach to education. Education, according to Bruner (1996), "…is a complex pursuit of fitting a culture to the needs of its members and fitting its members and their ways of knowing to the needs of the culture" (p. 43). Therefore, for Bruner (1996), meaning making is not a private activity, but shared with ones culture because "mind could not exist save for culture" (p. 3). Additionally, Bruner reflected on four key ideas of how teachers teach and students learn, which included reflection (making sense of what is learned), agency (taking control of your own learning), collaboration (constructing meaning with others), and culture (a system of values, rights, exchanges, obligations, opportunities, and power). Finally, Bruner shared his view of the importance of narrative. He stated, "…skill in narrative construction and narrative understanding is crucial to constructing our lives and a "place" for ourselves in the possible world we will encounter" (Bruner, 1996, p. 40).

It was the work of Bruner et al. (1956), along with Miller (1956), that became the springboard for researchers who wanted to understand writing from a cognitive perspective. "These two early publications illustrate two of the issues that have engaged cognitive researchers and that have been applied in understanding writing" (MacArthur & Graham, 2016, p. 25). To begin with, Miller (1956) provided an early cognitive model showing the limitations of short-term memory, that humans can only manage about seven independent items of information at one time. "The model was important because the limitations of short-term memory that Miller described constitute a bottleneck through which many human thought processes must pass" (Hayes, 2012, p. 5). At the same time, writing researchers took the think aloud strategy (protocol analysis) used in Bruner et al.'s (1956) study and applied it to their own research.

These two research tools, cognitive process models and protocol analysis, were instrumental in understanding the thinking processes of writers. "Cognitive process models allowed researchers to theorize about the internal mechanisms that the behaviorists refused to consider and to think through the implications of these mechanisms for what people did" (Hayes, 2012, p. 5). A model is a visual representation to describe the parts of a system and how the parts work together. "Protocol analysis is a technique in which a person is asked to think aloud, that is, say what is on the "top of their mind" while performing a task" (Hayes, 2012, p. 5). Sharing thought processes while doing a writing task, gave researchers a better understanding of what writers were thinking as they composed.

The Writing Process

It was not until the late 60's, early 70's that researchers began to examine more deeply the process students go through when composing a text. Up until this time, research focused on the product, rather than the process of writing. "A product perspective is concerned with the outcome of the writing process—the written product—but not the processes that generate that product" (Berninger, Fuller, Whitaker, 1996, pp. 193-194). Writing researchers

> …began looking into the question of how a writer actually worked at developing an individual piece of writing. Influenced by cognitive and sociocultural approaches to teaching and learning advanced by researchers such as Jen Piaget and Lev Vygotsky, they explored processes of composition. (National Writing Project & Nagin, 2006, p. 24)

Their studies provided the building blocks for the current writing process used to teach students to write.

Extensive & reflexive writing. Emig (1971) studied the process adolescent writers went through when they wrote. She wanted to know "what writers think and do as they write" (Tompkins, 2012, p. 4). Using a case study design, Emig (1971) examined the composing process of eight 12th grade students, five girls and three boys, from a variety of schools in the Chicago area. Emig (1971) had students compose aloud, giving oral accounts of prewriting and planning activities used for assignments, as well as the total process they went through while writing. Participants engaged in two modes of writing, school-sponsored (extensive) writing and self-sponsored (reflexive) writing.

For these participants, in school-sponsored writing teachers were the most significant audience and writing assignments were usually based on the literature being studied or abstract topics. Emig (1971) discovered that prewriting and planning time was not provided; therefore, students started their writing very matter-of-factly and had no discernible stopping point. Additionally, students did not pause to contemplate what was written or revise. Emig (1971) found their attitudes were "often detached and reportorial" (p. 91).

For self-sponsored writing, participants themselves or their peers were the most significant audience and they wrote most often about self or human relations (Emig, 1971). Prewriting and planning were a longer process and Emig observed more discernible moments of participants starting, stopping, contemplating, and reformulating what they had written. The participants' engagement was "at once committed and exploratory" (p. 91).

Conception, incubation, & production. To understand the process children went through when writing, Britton, Burgess, Martin, McLead, & Rosen (1975) studied over 2000 pieces of writing from 500 boys and girls in secondary school. The participants came from sixty-five schools throughout England. They concluded that the writing process was divided into three stages: conception, incubation, and production. The three stages were recursive. For example, although conception and incubation were preliminary or preparatory stages, neither ended when writing began. Conception and incubation can be revisited during production, and this cycling through the stages can happen at any time during the writing process.

During the first stage, conception, writers choose a topic to write about. The topic may or may not be forced upon the writer, yet the writer must connect what he knows to the assigned task. For children, conception can be harder than actually writing. "…[The] conceptions stage is completed when the writer knows that he is going to write and he has formed some idea of what is expected of him…" (Britton et al., 1975, p. 25).

Incubation, the second stage, is a time to gather information on the topic. This time of planning "…consists of arriving at an understanding, working towards a synthesis, [and] coming to terms with a general principle" (Britton et al., 1975, p. 30). Teachers may provide a ready-made plan or students may come up with their own plan. Talking with oneself or with others is beneficial during this stage, as it can bring clarification and insights from others.

During the third stage, production, writers put their thoughts on paper. They write, revise, and edit. Getting started can be challenging and once a writer gets started, writing is not always a continuous movement forward. Interruptions occur, for example, pausing to think or scanning back over what was written. The writing process is recursive.

Prewriting, composing, & postwriting. Over a five-month period, from a case study design, Graves (1975) explored the writing process second graders went through when composing a text. Although Graves (1975) chose to report only one case study, observations and interviews from all the cases were used in his report. He observed three phases of writing: prewriting, composing, and postwriting. Graves (1975) defined each phase:

Prewriting phase. This phase immediately precedes the writing of the child.

Composing phase. This phase begins and ends with the actual writing of the message.

Postwriting phase. This phase refers to all behaviors recorded following the completion of writing the message. (p. 251)

Graves (1975) found that young children used a variety of writing strategies and the writing process was unique to each individual.

Hayes & Flower Model. As a way to better understand the composing process of skilled writers, Hayes & Flower (1980) developed a writing model by watching writers in action. Using the method of protocol analysis (Bruner, et al., 1956) mentioned above, Hayes and Flower (1980) asked participants to compose aloud in order to understand the thinking processes that skilled writers used while composing. Hayes & Flower (1980) proposed that writing involved three elements: the task environment, the writer's long-term memory, and the writing process.

The task environment involved the happenings outside the writer, which included the rhetorical problem (the assignment) and the text-produced so far (Flower & Hayes, 1981; Hayes & Flower, 1980). Writers considered the topic, audience, and exigency in conjunction to a growing text. Both put constraints on the writer, as the writer makes a plan, taps into knowledge stored in long-term memory, and balances the demands of time and attention to the growing text (Flower & Hayes, 1981; Hayes & Flower, 1980).

Knowledge of a topic, audience, and plans for answering the rhetorical problem are stored in the writer's long-term memory. The challenge lies in retrieving,

organizing, and adapting the stored knowledge into sentences that accurately solve the rhetorical problem. Without long-term memory writers could not write (Flower & Hayes, 1981; Hayes & Flower, 1980).

Writers have a toolkit filled with the writing processes of planning, translating, and reviewing which are under the control of the monitor (Flower & Hayes, 1981; Hayes & Flower, 1980). Each process is recursive, meaning it can be repeated or used at any time during writing. These "cognitive processes provides a description of the mental operations writers employ while composing" (MacArthur & Graham, 2016, p. 26).

When planning, writers take information from the task environment and their long-term memory to set goals and make a writing plan. In other words, "…writers form an internal *representation* of the knowledge that will be used in writing" such as a fleeting image that is put into words (Flower & Hayes, 1981, p. 372). There are three parts to planning: generating, organizing, and goal setting. Writers retrieve information from long-term memory (generating ideas), structure ideas in a meaningful way (organizing), and develop and refine goals (goal-setting) (Flower & Hayes, 1981; Hayes & Flower, 1980).

Translating occurs when the writer puts ideas into visible language. Translating is a demanding task, which can be overwhelming for children. According to Flower & Hayes (1981), "If the writer must devote conscious attention to demands such as spelling and grammar, the task of translating can interfere with the more global process of planning what one wants to say" (p. 373), which can lead to frustrated writers.

The text written during the translation stage is improved during the reviewing stage. Writers read what they have written thus far and either continue translating or begin evaluating and/or revising the text. Writers revise written statements, but can revise unwritten thoughts as well. Reviewing can occur at any time and lead to new cycles of planning and translating (Flower & Hayes, 1981; Hayes & Flower, 1980).

The monitor, or writer, is a strategist that controls the writing processes and plans what to do next. The monitor determines when and at what point to move through the writing processes. The next move is based on the goals and habits of the monitor (Flower & Hayes, 1981; Hayes & Flower, 1980). One important point that Flower & Hayes (1981) shared was "Children…possess the skills necessary to generate ideas, but lack the kind of monitor which tells them to "keep using" that skill and generate a little more" (pp. 374-375).

The Hayes and Flower (1980) model "served as a catalyst for most of the subsequent research on the cognitive nature of writing" (MacArthur & Graham, 2016, p. 26). It went through several revisions and modifications as writing research evolved over the years. Most importantly, "the Flower and Hayes model helped promote a "science consciousness" among writing teachers…[and]…many writing teachers believed cognitive research could provide a "deep structure" theory of *the* composing process, which could in turn specify how writing should be taught" (Faigley, 1994, p. 156). Furthermore, a simplified version of the model was developed for novice writers (Berninger & Swanson, 1994; Berninger, Yates, Cartwright, Rutberg, Remy, & Abbott, 1992).

The current writing process. These early researchers provided the foundation for current conceptions of the writing process, with five key features: prewriting, drafting, revising, editing, and publishing. The steps of the writing process are not linear but recursive, meaning each feature can be revisited at any time when composing. Perl explained it this way,

> Composing does not occur in a straightforward, linear fashion. The process is one of accumulating discrete bits down on the paper and then working from those bits to reflect upon, structure, and then further develop what one means to say. It can be thought of as a kind of "retrospective structuring"; movement forward occurs only after one has reached back, which in turn occurs only after one has some sense of where one wants to go. Both aspects, the reaching back and the sensing forward, have a clarifying effect (as cited in Perl, 1994, p. 55).

> *Prewriting.* Prewriting includes the activities that the writer does before

composing. Tompkins (2012) believes prewriting involves these activities: topic selection; considering a purpose, audience, and genre; generating and organizing ideas for writing. Depending on the assignment, students may choose the topic, teachers may choose the topic, or the topic can be chosen collaboratively with the teacher or peers. Students must decide the purpose of their writing (i.e., to entertain, inform, persuade), the audience (i.e., teacher, peer, family member), and the genre (i.e., personal, descriptive, narrative, expository). Ultimately, prewriting is any planning activity that "involves developing goals and generating ideas; gathering information from reading, prior knowledge, and discussion with others; and organizing ideas for writing based on the purpose of the text" (Graham, Bollinger, Booth Olson, D'Aoust, MacArthur,

McCutchen, & Olinghouse, 2012, p. 14). According to Donald Murray, "70% or more of writing time should be spent in prewriting" (as cited in Tompkins, 2012, p. 6).

Drafting. Drafting uses prewriting activities to get thoughts down on a first draft. It is a time to write (or speak) continuously, with a focus on word production. Activities associated with drafting include writing a rough draft and crafting leads (Tompkins, 2012).   When writing a rough draft, writers concentrate on getting words down without worrying about conventions (i.e., grammar, spelling) or making improvements, although changes to purpose, audience or genre may occur. Also important during drafting is creating a lead that will capture the reader's attention. A creative lead hooks the reader into reading more. An important reminder while drafting, "Almost all good writing begins with terrible first efforts. You need to start somewhere. Start by getting something—anything—down on paper" (Lamott, 1995, p. 25).

Revising. Revising is a time to clarify ideas and make changes for the better, approaching the rough draft with an editorial eye. Activities involved in revising include: rereading the rough draft, sharing the rough draft, and revising the rough draft based on feedback (Tompkins, 2012). When rereading a rough draft, writers can spot areas that need improvement and add, substitute, delete, or move words, sentences, or paragraphs. Writers may also move back into the prewriting and drafting stages. Revision groups provide writers a time to share their writing, gain support from their peers or teacher, and receive constructive feedback.

Editing. When editing, the writer locates errors and makes corrections in capitalization, grammar, punctuation, and spelling. Tompkins (2012) offers the

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following activities for editing: distancing oneself from the composition and proofreading and correcting errors. Stepping away from the composition gives the writer a chance to rest and come back with fresh ideas. At times, revising and editing occur concurrently.

　　　　Publishing. Publishing is creating the final copy of a writer's work. It is a time to celebrate all the hard work that went into the composition. Published pieces are usually handwritten or typed, but there is no limit on the creativity of a published piece, as some may be published on notebook paper while others are published in a book. Sometimes published pieces are shared with others, but other times are meant only for the writer to see.

　　　　6+1 traits of writing. In addition to The Writing Process, Culham (2003), with the help of other researchers from the Northwest Regional Educational Laboratory, developed the 6+1 Traits of Writing, which included ideas, organization, voice, word choice, sentence fluency, conventions, and presentation. As defined by Culham (2003) the 6+1 Traits are:

1. **Ideas:** Ideas make up the content of the piece of writing—the heart of the message.
2. **Organization:** Organization is the internal structure of the piece, the thread of meaning, the logical pattern of the ideas.
3. **Voice:** Voice is the soul of the piece. It's what makes the writer's style singular, as his or her feelings and convictions come out through the words.

4. **Word Choice:** Word choice is at its best when it includes the use of rich, colorful, precise language that moves and enlightens the reader.

5. **Sentence Fluency:** Sentence fluency is the flow of the language, the sound of word patterns—the way the writing plays to the ear, not just to the eye.

6. **Conventions:** Conventions represent the piece's level of correctness—the extent to which the writer uses grammar and mechanics with precision.

+1. **Presentation:** Presentation zeros in on the form and layout—how pleasing the piece is to the eye. (pp. 11-12)

The traits are interwoven into the writing process. Culham (2003) groups the traits into revisions traits (ideas, organization, voice, word choice, sentence fluency) and editing/publishing traits (conventions, presentation). Yet, Tompkins (2012) uses the traits during each phase of the writing process: prewriting traits (ideas, organization); drafting traits (ideas, organization, voice, word choice, sentence fluency); revising traits (ideas, word choice, sentence fluency); editing trait (conventions); publishing trait (presentation). The 6+1 Traits of Writing help writers add depth and creativity to a piece of writing.

Voice-to-Text

Dictation is scarcely a new concept. It has been around for thousands of years. Dictation takes the spoken word and puts it into written form. Before technology, people dictated to a scribe and some still choose this method of dictation. Yet, with new technologies, dictation has progressed from tape recorders to mobile devices and

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computers. Dictating to a scribe requires dependence on another person, while dictation

to a mobile device or computer gives students independence (MacArthur & Cavalier,

2004). Additionally, when dictating to a computer the text is visible to the writer,

unlike dictating to a scribe (Quinlan, 2004).

Gardner (1980) wrote about his experience dictating to a tape recorder. He first

spoke of the anxiety he felt when switching from handwriting to typing, yet how great

and valuable the reward because of the speed and efficiency he gained from typing.

Later on, Gardner made another switch when he moved from typing to dictating to a

tape recorder, which resulted in an even greater reward. Gardner (1980) stated,

"Without a doubt, dictating instead of typing can improve writing output. It can,

perhaps, also improve quality" (p. 19). Gardner (1980) found dictation to improve

output because (a) it forces the writer to outline the piece in advance; (b) thinking

unfolds naturally at the speed of speech, with little interruptions; (c) fleeting thoughts

are captured before ideas are lost. Although Gardner dictated to a tape recorder, much

can be learned from his experience and applied to dictating to a computer.

Dictation technology has developed over the last several decades and is known

as speech recognition (SR), voice recognition, or voice-to-text. The earliest versions of

dictation software were called discrete SR systems (i.e., VoiceType). With discrete SR,

users dictated word by word. As improvements were made to the technology, users no

longer had to dictate word by word, but could speak continuously. Continuous SR

systems (i.e., Dragon, Google Voice Typing) allow the speaker to dictate at a normal

speaking rate and see the words on a screen as they dictate. Over the years, researchers

have studied how using SR systems can help children with writing.

Wetzel (1996) conducted an exploratory study to determine if intermediate-grade students with written language difficulties could improve their writing by using VoiceType. Wetzel's study was one of the first published reports on the use of discrete SR software for students with learning disabilities. The participant in Wetzel's study was a sixth grade boy with learning disabilities. For 10 weeks, he trained and used the software to write six short narrative pieces. As Wetzel's study continued, the participant's dictations rate increased from 2.5 words per minute to 5.5 words per minute, and he improved recognition of his voice from the first two sessions (40%, 23%) to the last two sessions (71%, 74%). Although his rate of dictation improved as well as unwanted sounds or utterances, he struggled to spell words the system did not recognize. As a result, the participant became frustrated when using VoiceType to write.

MacArthur & Cavalier (2004) investigated whether continuous SR software (Dragon Naturally Speaking, Version 4) should be used as a test accommodation for high school students with learning disabilities (LD). For this quantitative study (repeated measures group design), 21 students with LD and 10 students without LD received 6 hours of training. During the training they learned how to plan a persuasive essay and how to dictate using Dragon Naturally Speaking. Each student handwrote an essay, dictated an essay to a human scribe, and dictated an essay using SR software. Students with LD made fewer word errors and produced better quality essays with SR than with handwriting, but not as high quality as to a scribe. Students without LD did not have better quality essays when using dictation. The authors cautioned readers to note that only 10 students without LD participated in the study, making generalizations

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difficult. For both groups, differences in length and vocabulary were not affected; and composing time was faster to a scribe than handwriting and SR.

Quinlan (2004) investigated how advanced planning and SR (Dragon Naturally Speaking Professional 5.0) would affect how less fluent writers composed a text. The quantitative study (between subjects, repeated measure design) had 21 less fluent writers and 20 fluent writers attend a 6-hr Technology Writing Workshop in groups of 2 to 4. During the training, participants learned how to use Dragon Naturally Speaking Professional and how to plan a narrative. Each participant created a narrative text under four different writing conditions: SR with advanced planning, SR without advanced planning, handwriting with advanced planning, and handwriting without advanced planning. The results showed that handwritten narratives of fluent writers were superior to less fluent writers in terms of length, quality and surface errors. Less fluent writers using SR had more words, incorporated more background and details, and had fewer errors compared to their handwritten narratives. "SR apparently reduced transcription-related interference, freeing working memory resources for text production" (Quinlan, 2004, p. 342). Fluent writers did not improve in writing fluency or accuracy when using SR; therefore, for Quinlan's (2004) study SR supported composing only when writing difficulties were present. Nonetheless, advance planning appeared to benefit both fluent and less fluent writers.

Schneider, Codding, & Tryon (2013) investigated using handwriting, a word processer and SR (Dragon Naturally Speaking Preferred) to improve the writing skills of four participants in grades 4, 5, and 6 with Asperger syndrome. The quantitative study (a multiple-phase alternating-treatments design) took place twice a week after

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school in each participant's home. When participants used SR to complete writing homework, they produced longer, more fluent, and higher quality work then when doing writing homework by handwriting or with a word processor. Adding the writing intervention, Self-Regulated Strategy Development (Graham & Harris, 1989), with SR resulted in an even higher performance, but the same level of accuracy.

Baker (2016) conducted an ethnographic study, informed by sociocultural and systems theory, to examine if SR (Dragon & Siri Apps) was feasible for early elementary students who struggled with reading. Taking on the role of teacher assistant, Baker became part of a first grade classroom culture, learning the dynamics of the classroom and building relationships with students during the first semester of school. The second semester of school, she introduced SR in a writing center with eight of the lowest performing students. Each participant used SR on an iPad as a tool for drafting compositions. Participants dictated rough drafts and copied the draft from the iPad to paper using a pencil. During the study, Baker made an adjustment when she realized students were forgetting what they wanted to say when they were turning on SR. She implemented a think aloud strategy where participants would think about what they wanted to say right before it was time to dictate. Baker (2016) also discovered that students would change vocabulary to easier words if SR misrecognized bigger words (e.g., dandelion to flower). For these participants, misrecognitions made them frustrated, but overall they liked using SR to write and were amazed at all they could accomplish when using SR.

Training. SR training looked different for each study. Wetzel (1996) trained his participant to use VoiceType over the first few sessions, and reviewed and practiced

at the beginning of each subsequent session. Wetzel's participant trained the system to

recognize his voice patterns by using general vocabulary and commands (session one),

learned how to pause between words (session two), and learned commands and

procedures (starting at session three). MacArthur & Cavalier (2004) trained participants

over five sessions. In session one, participants trained SR to recognize their voice.

They learned basic dictation skills in sessions two and three and basic correction

procedures in sessions four and five. Quinlan (2004) trained participants during the first

three hours of a technology-writing workshop. First, participants received direct

instruction watching Quinlan compose with SR, properly use and place the microphone,

and use commands for correcting errors and editing. Then, through guided practice

participants created voice files, conducted speech exercises, practiced using commands,

and practiced composing narratives. The participants in Schneider et al.'s (2013) study

received two 30-min sessions of training that was included in the SR software. The

details of what was included in training were not provided. Baker (2016) did not

provide details on how students were trained to use SR.

As with any new technology, practice yields better results. The participants in

each of these studies had no prior experience using SR. Furthermore, the only practice

they received was during the training sessions. Wetzel (1996) & Schneider et al. (2013)

felt that more training would be beneficial to participants. MacArthur & Cavalier

(2004) stated, "…if students use speech recognition regularly for academic instruction,

their skill and the quality of their written performance might also improve" (p. 56).

The same idea was echoed by Hartley, Sotto, & Pennebaker (2003) who see SR as a

higher order thinking skill that is difficult to learn at first, but with practice becomes increasingly easier to use.

   Limitations. There are some limitations found in the research when using SR. One concern was the accuracy of SR (MacArthur & Cavalier, 2004). The mean accuracy in MacArthur & Cavalier's (2004) study was 87%, meaning SR correctly dictated spoken words with 87% accuracy. They believed accuracy might improve by using SR on a regular basis. Participants in Quinlan's (2004) study met a minimum competency of 80% accuracy during training. For Wetzel's (1996) study, the best rate was 74% during the 13th session. Baker (2016) did two trial tests before her study to examine the accuracy rates of Dragon and Siri. In the first trial, Dragon accurately transcribed 74% of spoken words and in the second trial Dragon accurately transcribed 51.6% of the words and Siri accurately transcribed 72.3% of the words. One advertisement for SR software claimed adults dictate up to 99% accuracy. Clearly, there is a discrepancy between children and adult dictation rates.

   Another limitation was the additional burdens SR inflicted on the writers (MacArthur & Cavalier, 2004). Although SR freed up low-level concerns such as spelling and handwriting, it imposed new cognitive burdens like careful dictation, vocabulary building, and dictating commands for capitalization, punctuation, formatting, and editing (De La Paz, 1999; MacArthur, 2000; MacArthur & Cavalier, 2004; Quinlan, 2004; Wetzel, 1996). As participants dictated, they had to be very careful to articulate their words so the words were not misrecognized. They also had to avoid making extraneous sounds because noises were recorded too. Learning to use SR meant learning a new set of skills.

A third limitation was the new types of mistakes writers had to recognize (MacArthur & Cavalier, 2004). SR did not make spelling errors, only misrecognitions. For example, a user said "island" and SR dictated, "I went" (Baker, 2016). The user must learn new editing skills of recognizing and monitoring misrecognitions (MacArthur & Cavalier, 2004). The additional burdens listed above and learning to recognize these new types of mistakes were frustrating for some participants (Baker, 2016; Schneider et al., 2013; Wetzel, 1996). Quinlan (2004) thought participants became distracted by errors that needed correction because the more corrections they made when composing, the lower quality of their writing.

A fourth limitation was time. In order to learn how to use SR, training must occur. Training was time consuming; as users learned how to dictate, use commands, and correct errors. Additionally, training the system to recognize their voice was a daunting task. Yet, the more time that was spent on training the system, the better it dictated.

A fifth limitation was a quiet space. When dictating with SR, the environment must be very quiet. SR was very sensitive to sound and recorded everything it heard, even a cough or sneeze (Wetzel, 1996).

Motivation. De La Paz (1999) stated, "…the mechanics of writing can have adverse effects on a writer's persistence and motivation during composing" (p. 175). Writing does not come easily to some students, so finding ways to motivate these students to enjoy writing is no easy task. Technology, and more specifically dictation technology, could be a motivator for some students. In fact, when composing with SR,

Baker's (2016) participants made comments such as "I wish I could write every day" and "I've written a whole story!" (p. 300).

  Participant views. In MacArthur & Cavalier's (2004) study, 18 out of 29 participants had a positive view of SR. Other reasons for liking SR included: "it was fun" or "cool", speed, not having to write, helped with spelling and getting thoughts down. Reasons for not liking SR included: misrecognitions, time needed to correct errors, and difficulty of training SR (MacArthur & Cavalier, 2004, p. 53). Participants in Baker's (2016) study began to see themselves as authors and made comments about how they liked using SR and that it helped with writing hard words. Many were amazed at how much they could write when using SR.

Voice-to-Text and The Writing Process

  Although it looked a little different, writers still moved through recursive phases of prewriting, drafting, revising, editing and publishing when using technology to write.

   It is not surprising that much of what we have known about writing over time also applies to digital writing.   Supporting students in the process of writing, studying the craft of writing, and helping students analyze and understand the rhetorical situation for their writing thus remain hallmarks of an effective writing curriculum that aims to create reflective, flexible, self-aware writers. (National Writing Project, with Devoss, Eidman-Aadahl, & Hicks, 2010, p. 42-43)

  Prewriting. One strategy writers used during prewriting was organizing ideas. Making an outline was one way to organize ideas. Before dictating, Gardner (1980) prepared by reading the required material, digesting and thinking about it, and making

an outline of the major points. He used the outline as he dictated his composition to the tape recorder.

Using a graphic organizer was another way to organize ideas. Schneider et al. (2013) and Quinlan (2004) taught participants how to use a graphic organizer to plan a narrative, while MacArthur & Cavalier (2004) taught participants how to use a graphic organizer to plan a persuasive essay. The graphic organizer in Schneider's et al. (2013) study was called WWW and asked seven questions related to a narrative text (e.g., Who is the main character?). Graphic organizers supported "the organizing and generating of content" (Quinlan, 2004, p. 339) and facilitated "a productive shift toward text generation" (p. 343).

A second strategy writers used during prewriting was generating ideas. Writers used their background knowledge and information they collected to think about the composition. Wetzel (1996) taught a participant to generate ideas by making a keyword bank and orally rehearsing (thinking aloud) his narrative before dictating it. After Baker (2016) found participants struggling to remember what to say when it was time to dictate, she also taught participants how to rehearse their ideas aloud before dictating. Schneider et al. (2013) taught participants a strategy called POW (Pick my idea, Organize my work, Write and say more) to assist them in generating ideas.

Drafting. Gardner (1980) dictated drafts by talking into a tape recorder. As Gardner began his dictation, he acted as though he were giving a lecture, at times transcribing quickly and other times slowly. Once his draft was complete, he did not use dictation for any other stage of the writing process. Similar to Gardner (1980),

Baker's (2016) participants used SR only for drafting. Participants transcribed their ideas using SR and then copied their transcriptions with paper and pencil.

When drafting with SR, participants used a microphone to speak or transcribe their thoughts into words on the computer or iPad. During training, participants were taught to speak and enunciate clearly and were instructed on how to use writing strategies when drafting. One strategy participants used during the drafting stage was monitoring. When writers used monitoring, they monitored their progress, making adjustments where needed. Schneider et al. (2013) taught participants to generate and use self-statements to monitor and manage their writing, for example, "If I take my time, a good idea will come to me" (p. 104).

Organizing was a strategy used during prewriting, but was used during drafting as well. Wetzel's (1996) participant used the keyword outline (created during prewriting) as a guide when dictating his draft using VoiceType. Schneider et al. (2013) had participants refer to their WWW graphic organizer (created during prewriting) as they orally composed their compositions with Dragon.

Editing. When editing with SR, users make corrections with their voice or the keyboard. The participant in Wetzel's (1996) study used VoiceType and the keyboard to edit. He struggled when VoiceType misrecognized his words, because he had to correctly spell the word he was trying to say. He was not a great speller; therefore, this was a frustrating process for him.

Other studies did not provide information on how participants edited with SR, but revealed findings connected to editing. Quinlan (2004) found the more times children had to correct errors with SR, the lower the quality of their narrative; yet, less

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fluent writers profited by trading spelling errors in handwriting with less errors in SR.

When interviewing participants about their experience using SR to compose,

MacArthur & Cavalier (2004) found LD students liked using SR because they did not

have to worry about spelling, yet some participants did not like when SR made

misrecognitions or when they had to spend time correcting errors. Additionally, LD

students made more errors when handwriting than when using SR. Overall Schneider,

et al. (2013) found that participants did not seem to worry about spelling as much when

using SR, although two of the participants struggled with grammar and spelling when

using SR.

  Revising/Publishing. Most studies did not provide details on how participants

used SR to revise or publish. MacArthur & Cavalier (2004) stated that participants

"dictated corrections and changes as they wished during composing and revising

phases" (p. 49). Quinlan (2004) found that narratives created with SR were more

readable. For her study, Baker's (2016) participants did not use SR to revise, edit or

publish their compositions. She found the task of revising and editing with SR too

burdensome for the young writers; therefore, her goal was to use SR strictly as a

drafting tool. Participants dictated a draft, copied it onto paper with a pencil, edited and

revised on the paper, and Baker (2016) typed their completed compositions into a Word

template to print into a minibook. Additionally, participants recorded and listened to

their stories in the SR app (Baker, 2016).

Voice-to-Text and Translation

  Translation is one part of the writing process included in the Hayes and Flower

(1980) Model for skilled writing. Flower & Hayes (1981) defined translation as the

process of "putting ideas into visible language" (p. 373). Berninger et al. (1992) reasoned that for beginning and developing writing, the translation component in the Hayes and Flower (1980) model had two sub-components, the text generator and the transcriber. "Whereas *text generation* is the transforming of ideas into language in working memory, *transcription* is the translating of these language representations in working memory into written symbols on the printed page" (Berninger et al., 1996, pp. 196-197).

For the most part, the text generator and the transcriber develop together, but sometimes the text generator develops more rapidly while the transcriber is underdeveloped or vise versa. For example, some children are more successful at orally translating a story, which requires only text generation, than handwriting a story, which required both text generation & transcription. Knowing that the text generator is independent of written language while the transcriber is specific to written language (Berninger et al., 1992), could be helpful in understanding the challenges transcription imposes on some students.

Graham described the transcription process as "transcribing the words the writer wants to say into written symbols on the page" (as cited in MacArthur, Graham, & Fitzgerald, 2016, p. 31). In order to translate language representations into printed words, writers choose from different transcription modes such as handwriting and typing (graphomotor writing modes) or dictation and SR (speech-based writing modes) (Quinlan, 2004). It is important to note that transcription mode can interfere with the writing process as explained by Hayes (2012),

1. The more demanding the transcription mode, the more transcription will interfere with other writing processes (mode effect). Thus, typing produces more interference than handwriting, and handwriting, in turn produces more interference than dictation.

2. The more experienced the writer is with the transcription task, the less transcription will interfere with other writing processes (experience effect). Thus older children and children with training in a particular transcription mode will tend to experience less interference than other children. (p. 18)

To illustrate further, when a child's working memory is focused on low-level transcription concerns (i.e., spelling, handwriting, typing), it leaves little working memory for high-level composing concerns (i.e., planning, content generation) (De La Paz, 1999; MacArthur & Cavalier, 2004; MacArthur et al., 2016; Quinlan, 2004). For example, when low-level transcription concerns interfered with higher-level composing concerns, writers forgot their thoughts and ideas (De La Paz, 1999). At times they forgot their ideas because they could not write as fast as they thought. When dictating to a tape recorder, Gardner (1980) found that dictation "permits closer synchrony between thoughts and word production" (p. 14). For him, dictation was a natural flow of ideas, similar to talking or lecturing. Like dictation, SR has the potential to allow students to "compose at rates closer to their speed of thought, thereby allowing them to capture ideas before they were forgotten" (De La Paz, 1999, p. 174).

Of equal importance, changing the transcription mode could also decrease transcription-related interference. For example, students who struggle with handwriting or typing could switch to a speech-based writing mode, like SR. According to Quinlan

(2004), "Writing tools that reduce transcription load should benefit children with writing difficulties because such tools leave more working memory resources available for text generation…[and]…few users of speech-based writing tools should experience transcription-related interference" (p. 338). Yet, as Hayes (2012) pointed out, "Less practiced or more difficult transcription modes tend to require more cognitive resources. As writers get more experience with a transcription mode, the amount of cognitive resources required by that transcription mode decreases" (p. 18).

Chapter 3: Methodology

A multiple-case study using a qualitative approach was used to explore how elementary age students used voice-to-text (i.e., Google Voice Typing) to compose. How students responded to using voice-to-text as a method of composing, the effect of voice-to-text on features (i.e., content, appearance, etc.) of composition, and the change of the composing process for students was examined.

This chapter provides a rationale for design, the selection process, the data collection methods, and data analysis. In addition, the chapter summarizes the strategies used to ensure trustworthiness.

Theoretical Framework

Epistemology is what one believes about the nature of knowledge, that is, the belief of what knowledge is and how it is created. I adopt constructionism as my epistemological stance because I believe reality is socially constructed. Crotty (2015) states, constructionism

> …is the view that *all knowledge, and therefore all meaningful reality as such, is contingent upon human practices being constructed in and out of interaction between human beings and the world, and developed and transmitted within an essentially social context.* (p. 42).

Meaning is constructed as humans interact and engage with their surroundings. The world and objects in the world have no meaning until this happens. Once the human mind interacts with the world and objects in the world, meaning is constructed. In other words, through consciousness, objects acquire meaning.

Ontology is what one believes about the nature of reality. It is my belief that meaning is not constructed in one single way, but "…there are multiple realities, or interpretations, of a single event" (Merriam & Tisdell, 2016, p. 9). As the researcher, I come into the study with my own set of realities, as does each participant and each reader. Therefore, as Creswell (2013) suggests, "the use of multiple forms of evidence in themes using the actual words of different individuals and presenting different perspectives" (p. 20) are included in this study.

My epistemological stance influences the theoretical framework for this study. Because I am interested in describing, understanding, and interpreting the experience of a phenomenon from the perspective of an individual, I take an interpretive or constructivist perspective. According to Crotty (2015), "…constructivism is primarily an individualistic understanding of the constructionist position…" (p. 58). He goes on to say, "Constructivism describes the individual human subject engaging with the objects in the world and making sense of them" (p. 79). That is, constructivism is an individual's way of interacting and understanding the world. Every individual constructs knowledge in a unique way, unlike anyone else. "Each reality is somewhat different, because each person's experiences and resulting apperceptions are different" (Jonassen, 1991, p.7).

In much the same way, "…writers don't find meaning, they *make* [meaning]" (Flower & Hayes, 1980, p. 21). Writing is constructing ideas, not finding them. Skilled writers construct their own unique representation of the rhetorical problem (i.e., assignment, audience, goals), meaning they understand what they are trying to do as they write. "If we can teach students to explore and define their own problems, even

within the constraints of an assignment, we can help them to create inspiration instead of wait for it" (Flower & Hayes, 1980, p. 32). Romano (1987) stated, "…students write to discover, create and explore their thinking, dig up prior knowledge, to cultivate intellectual independence, to conjecture about possibilities, to struggle with difficult concepts, and to engage the imagination as an ally in learning" (p. 34). Finally, Sondra Perl said it so well,

> Composing always involves some measure of both construction and discovery. Writers construct their discourse inasmuch as they begin with a sense of what they want to write. This sense, as long as it remains implicit, is not equivalent to the explicit form it gives rise to. Thus, a process of constructing meaning is required. Rereading or backward movements become a way of assessing whether or not the words on the page adequately capture the original sense intended. Constructing simultaneously affords discovery. Writers know more fully what they mean only after having written it. In this way the explicit written form serves as a window on the implicit sense with which one began. (as cited in Perl, 1994, p. 55)

Research Design

My research methodology is shaped by my epistemological stance and theoretical framework. Qualitative researchers believe reality is socially constructed, not "out there" as one single, observable reality. The researcher's goal is not to find knowledge but to construct it. There are four main characteristics as suggested by Merriam & Tisdell (2016):

- The researcher seeks to understand how people interpret their experience.

- The researcher is the primary instrument for data collection.

- Research is inductive, not deductive.

- The product is descriptive, not numeric.

Merriam & Tisdell (2016) state, "…qualitative researchers are interested in *understanding the meaning people have constructed*, that is, how people make sense of their world and the experiences they have in the world" (p. 15). Thus, the participant's perspective and understanding the participant's experience and what the experience was like for them is of importance. The focus of this study was based on each participant's perspective of using Google Voice Typing to compose.

In qualitative research, the researcher is the primary instrument for gathering data. There are advantages and disadvantages to being the primary data collector. Advantages include being able to "be immediately responsive and adaptive" and to "expand…understanding through nonverbal as well as verbal communication, process the information (data) immediately, clarify and summarize material, check with respondents for accuracy of interpretation, and explore unusual or unanticipated responses" (Merriam & Tisdell, 2016, p.16). Yet, being so close to the research, the researcher's biases can greatly impact a study. As the primary data collector, the researcher has no one but herself to rely on to make all the right decisions and interpretations. For this reason, the researcher identifies and monitors any biases that arise during the study.

Qualitative research is inductive, not deductive, meaning data is gathered to build a hypothesis, not to test a hypothesis. Specific raw data from interviews, observations, or documents grow into abstract or general themes. It is important to

note, when testing a hypothesis, it is possible to predict the behavior; this is not the case for qualitative research, as variables are unknown ahead of time.

Lastly, the final product of qualitative research is descriptive, not numeric. The researcher communicates the findings through words or pictures, by describing the context, participants, or activities (Merriam & Tisdell, 2016). The final product uses quotes from the participant(s) or other specific information from the field notes and interview(s).

This qualitative study uses a multiple-case study design. A multiple-case study provides an in-depth description and analysis of several individual cases. There are two stages of analysis. First, a with-in case analysis gathers findings from individual case studies separately. Then, a cross-case analysis looks at all the cases together; building a general explanation that addresses each research question. A multiple-case design can strengthen the validity and stability of the findings (Merriam & Tisdell, 2016).

According to Merriam & Tisdell (2016), "A *case study* is an in-depth description and analysis of a bounded system" (p. 37). To check for boundedness, Merriam & Tisdell (2016) suggest asking two questions: (1) Is there a limit to the number of people involved? (2) Is there a finite time for observations? If the answer is "yes" to both questions, the case is bounded. The bounded system, or unit of analysis, for this case study consisted of students in second to fourth grade, from a private, urban elementary school in a large southwestern city, who were either reluctant writers or had poor writing or handwriting skills. The study was bounded by time (2 months) and used multiple cases (four students attending a Technology Writing Workshop on separate occasions).

Participants

"Purposeful Sampling is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned" (Merriam & Tisdell, 2016, p. 96). To qualify for this study, participants had to be a second to fifth-grade student from a private urban elementary school in a large southwestern city, meeting one of the following additional criteria:

- reluctant writer (i.e., can write, but does not have the motivation to write);

- poor writing skills (e.g., disorganized or limited ideas, poor leads, plagiarism, unfocused writing, weak sentence structure, poor word choice, does the bare minimum);

- poor handwriting skills.

The school and principal gave permission for this study to be conducted. To recruit participants, an email was sent to second to fifth-grade teachers at the school. The email explained the study as part of a Technology Writing Workshop that included instruction in writing and using Google Voice Typing. Additionally, the email asked teachers to identify students to participant in the study based on the above criteria and to send home a flier with students who met the criteria, encouraging interested participants to contact me. Three parents (one parent had two children) contacted me in person or by email about having their child participate in the study. The four participants selected for participation were Peniqua (3rd grader), Johny (2nd grader), Trixie (4th grader), and Sam (4th grader) (Table 1).

Table 1

Participant Information

Student	Gender	Grade	Handedness	Reluctant writer	Poor Writing Skills	Poor Handwriting Skills
Peniqua	Female	3rd	Right Handed	X		
Trixie	Female	4th	Right Handed	X		
Johny	Male	2nd	Right Handed			X
Sam	Male	4th	Left Handed	X	X	X

Procedure

Equipment. Participants used a MacBook Pro (13-inch, Late 2011) laptop (with 4GB of RAM and an Intel Core i5 processor, running at 2.4 GHz). To create compositions, participants used Google Docs, Google Voice Typing, a Blue Snowball USB Microphone or Apple EarPod Headphones. Google Voice Typing is a free continuous-speech dictation program built into Google Docs and only available in Chrome browsers.

Technology writing workshop. Parents of participants were sent a letter (Appendix A) with a description of the study, including the ethical guidelines for participation in the study. The letter explained (1) the purpose of the research; (2) what was expected of the participant; (3) the length of the study; (4) the risks and benefits; (5) compensation for participating; and (6) protection of participant's information and identity. The letter assured that participants could withdraw at any time and would not be penalized. Once parental permission was granted for participants to attend the Technology Writing Workshop, dates were set. Parents also gave permission for

participants to be audio and video recorded. Participants could withdraw at any time.

Participants attended the Technology Writing Workshop independently. The workshop

was conducted at the participants' school over five sessions. The procedural protocol

below was followed for each participant to ensure procedural integrity and consistency

(Table 2).

Table 2

Summary of Each Session

Session	Time	Setting	Method	Activity
1	about 2 hrs.	Researcher's Classroom	Face-to-Face Participant & Researcher	Signed Child Assent Attitude Survey HWS, HWNG
2	about 2 hrs.	Researcher's Classroom	Face-to-Face Participant & Researcher	GV Training
3	1.5 - 2 hrs.	Researcher's Classroom	Face-to-Face Participant & Researcher	GVS, GVNG
4	1.5 - 2 hrs.	Researcher's Classroom	Face-to-Face Participant & Researcher	Attitude Survey Interview
5	30 min to 1 hr.	Researcher's Classroom	Face-to-Face Participant & Researcher	Follow-Up Interview

Note. Handwritten, spontaneous = HWS; Handwritten, narrative Guide = HWNG; Google Voice Typing = GV; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative Guide = GVNG

Session One: Signed Child Assent (7-11 years), Attitude Survey, and

Writing via Handwriting. Session one took place in my classroom, lasting about two

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hours. To begin the session, the assent form (Appendix B) was read aloud to each

participant, ensuring that each child understood his/her part in the study. I answered

questions and had the child sign the form. After the participant signed the assent form

and, in order to keep the participants' identity anonymous and confidential, each

participant chose a pseudonym to use in place of their real name.

To begin the Technology Writing Workshop, participants took the Elementary

Writing Attitude Survey (Kear, Coffman, McKenna, Ambrosio, 2000). Next,

participants were introduced to the narrative genre by examining the elements of story

structure (i.e., plot, setting, characters, etc.) in mentor texts. Participants discussed the

story elements of each mentor text, analyzing how the author applied each element to

the story. Then, participants were instructed to compose a spontaneous narrative

writing. To honor the time given for each activity, a timer was set for each writing

process. At the end of each time period, if participants needed more time, they were

granted additional time. 15 minutes were given for prewriting and drafting. When time

was up, participants had about 10 minutes to revise and edit their handwritten

compositions. At the end of 10 minutes, participants assessed their compositions, using

a guide (Appendix C).

The second composition was a planned writing in which participants used a

graphic organizer (Appendix D) to plan their handwritten narrative. I modeled and

instructed participants on how to use the graphic organizer to plan the characters, plot,

setting, theme, and point of view of their story. Participants had about 10 minutes to

plan their narrative using the graphic organizer. After participants planned their

narrative, they had about 15 minutes to draft. When they were finished, they had about

10 minutes to revise and edit. Upon completion, participants assessed their composition

using a guide (Appendix C).

      Session Two: Training of Google Voice Typing.   Session Two took place in

my classroom, lasting about two hours. There were three stages of training. The first

stage of training was learning about Google Voice Typing and how to use it. The

process of dictating a composition using Google Voice Typing was modeled for each

participant. During the demonstration I used a Google Voice Typing tutorial (Fudickar,

2017) and modeled how to start a new document, get the microphone, compose orally,

and speak naturally but clearly with consistent volume and speed. I also demonstrated

how to read aloud a story while dictating with Google Voice Typing. During the

second stage of training, participants completed the same Google Voice Typing tutorial

that was modeled for them. For the last stage of training, participants dictated a short

story using Google Voice Typing. The purpose of dictating a story was to give

participants extra practice speaking clearly, dictating punctuation, and using commands.

As they dictated, they corrected mistakes with voice commands or by typing.

      Session Three: Writing via Google Voice Typing. Session Three took place

in my classroom, lasting about two hours. Once training was complete, participants

began the second writing session. During this time, participants dictated two

compositions using Google Voice Typing. First, participants were instructed to dictate

a spontaneous narrative writing. To honor the time given for each activity, a timer was

set for each writing process. At the end of each time period, if participants needed more

time, they were granted additional time. 15 minutes were given for prewriting and

drafting. When time was up, participants had about 10 minutes to revise and edit their

handwritten compositions. At the end of 10 minutes, participants assessed their compositions, using a guide (Appendix C).

The second composition was a planned writing in which participants used a graphic organizer (Appendix D) to plan their narrative. I modeled and instructed participants on how to use the graphic organizer to plan the characters, plot, setting, theme, and point of view of their story. Participants had about 10 minutes to plan their narrative using the graphic organizer. After participants planned their narrative, they had about 15 minutes to draft. When they were finished, they had about 10 minutes to revise and edit. Upon completion, participants assessed their composition using a guide (Appendix C).

Session Four: Writing Attitude Survey and Interview. Session Four took place in my classroom, lasting about two hours. During the fourth session, participants once again completed the Elementary Writing Attitude Survey (Kear et al., 2000) to determine if their attitude towards writing changed after using Google Voice Typing. Once the survey was completed, participants were interviewed. A one-on-one semi-structured interview was used for this study.

Session Five: Follow-Up. Session Five took place in my classroom, lasting 30 minutes to 1 hour. During the fifth session, participants listened to their responses to each interview question, correcting or clarifying meaning or misconceptions.

Data Collection

Case study research uses, "detailed, in-depth data collection involving multiple sources of information" (Creswell, 2013, p. 97). Data were gathered from interviews, observations, documents, and audiovisuals. Interviews helped to obtain information

that could not be observed, such as participants' feelings and spontaneous comments. Observations gave first hand accounts of what occurred in the natural setting. Documents provided a way to learn more about the person being studied. The audio and video recordings helped to fill in missing information.

Participant interview. A one-on-one semi-structured interview was used for this study. Semi-structured interviews are flexible, like a conversation, and use open-ended questions. Interviews are guided by a list of questions (Appendix E), not necessarily in any particular order, with probing questions and follow-up questions to clarify meaning. The interviewer avoided letting any personal views be known to the interviewee. The initial interview took place after the participants wrote four compositions, and lasted approximately one hour. A second interview was scheduled for approximately 30 minutes to one hour to allow participants a chance to review the transcript and clarify any points.

During the semi-structured interview, participants were asked questions over three major domains: (a) participant's response to using voice-to-text to compose, (b) the effect of voice-to-text on the content, appearance, or other features of compositions, and (c) how voice-to-text changed the composing process for participants. From these domains, the participants were asked questions, such as,

- "What was difficult or easy about using Google Voice Typing?"
- "How would you describe your writing after using Google Voice Typing?"
- "How do you think Google Voice Typing influenced (helped or worsened) your writing?"

After each interview was completed in session four, the audio and video recordings were used to transcribe interviews. Then, the interview was edited in order for the participants to be able to read it. During the member check in session five, participants were given a chance to correct, clarify, or make changes to their answers. After the member check, I read back through the interview and added analytical memos containing some preliminary analysis and interpretations in my journal.

Observations. Observations occurred in the setting of the phenomenon. According to Criswell (2013), when "the researcher is participating in the activity at the site," (p. 166) he or she is a participant as observer. Observations were documented on the observation checklist (Appendix F), with details about the physical setting, the participants, activities and interactions, conversations, and subtle factors. Additionally, participants were recorded via audio and video during the Writing Technology Workshop in order to get a full account of what occurred. To add to the field notes that were gathered during each session, I watched and listened to the video and audio recordings for each session, totaling about eight hours per participant. While watching and listening, I added to field notes and then wrote a highly descriptive, rich, and reflective narrative. While writing the narrative, I added to analytical memos containing some preliminary analysis and interpretations in my journal.

Documents. Data were collected using documents from four sources: Elementary Writing Attitude Surveys (Kear et al., 2000), compositions, rubrics, and narrative guides. These documents are considered researcher-generated documents because they were "…prepared by the researcher or for the researcher by participants after the study has begun" (Merriam & Tisdell, 2016, p. 174). Each participant took the

Elementary Writing Attitude Survey (Kear et al., 2000) before writing the first composition and after writing the last composition. The survey had 28 items that presented a brief, simply worded statement about writing. Following the statement were four Garfield pictures in which Garfield's mood appears to be very happy, somewhat happy, somewhat upset, and very upset. After reading the statement, participants' circled the Garfield that best represented their feelings. The survey gave a quick indication of each participant's attitude toward writing.

Writing conditions. Participants created four compositions under four different writing conditions, which included two levels of transcription (i.e., handwritten and Google Voice Typing) and two levels of planning (i.e., spontaneous writing and planned writing). The compositions were a valuable source of data as they provided a visual for participants when answering the interview questions. Additionally, the compositions were instrumental during the analysis stage.

After each composition was published, participants assessed the composition using the Narrative Mode Guide (The Culham Writing Company, 2016a) or Expository Mode Guide (The Culham Writing Company, 2016b) (Appendix C). An overall grade was given by the participant consisting of 1 or 2 = Just Starting, 3 or 4 = On My Way, 5 or 6 = I've Got It! The rubric guides provided an additional layer of insight into how participants' viewed the quality of their compositions.

When creating two of the compositions, participants used a narrative guide to plan their story. The narrative guide was created and adapted based on ideas presented by Tompkins (2012) (Appendix D). The graphic organizer was a tool used to help participants generate ideas for their narrative.

Data Analysis

According to Creswell (2013), "data analysis in qualitative research consists of preparing and organizing the data…for analysis, then reducing the data into themes through a process of coding and condensing the codes, and finally representing the data in…a discussion" (p. 180). Through data analysis, research questions are answered. Data analysis occurs in conjunction with data collection. To keep all the data organized and retrievable, a case study database was created for each participant. A file folder, labeled with each participant's pseudonym was kept for electronic data and physical data. The computer database included: Google Voice Typing compositions, video of each session, interview transcriptions and audio, field notes, and documents. The physical database included each participant's attitude surveys, writing compositions, mode guides, narrative guides, field notes, observations, and memos.

Because this was a multiple-case study, there were two stages of analysis. The first stage was a within-case analysis of the each individual case study, where each interview was analyzed followed by observations and documents. Merriam & Tisdell (2016) offer these steps:

1. Code relevant information or phrases from the first interview

2. Group codes that go together

3. Keep a running list of codes

4. Follow steps 1-3 for the first observation and first set of documents

5. Develop and name categories from the codes

6. Present findings in a descriptive single case write up

7. Follow steps 1-5 for each case study

To begin category construction, I printed and read through the entire first interview and jotted down notes and comments in the margin. After going through the entire interview, codes were grouped together. A running list of the codes was attached to the transcript. Next, I printed and read through my observations, coding as I went along, keeping in mind the list of codes from the interview and making a new running list of codes for my observations. The same plan was followed for the first set of documents as well. Finally, I compared the codes, looking for recurring patterns, and merged them into one master list of categories. When naming the categories, I made sure they would answer the three research questions.   Afterwards, a descriptive, rich single case write up was completed for each participant.

The second stage of analysis was a cross-case analysis. "Cross-case syntheses…treats each individual case study as a separate study" and aggregates findings across the studies (Yin, 2014, p. 164). The following guidelines from Yin (2014) were used:

- Create word tables displaying data from individual cases according to categories (first stage of analysis)

- Probe whether different cases appear to share similar (or contrasting) profiles

- Develop strong, plausible, and fair arguments supported by the data.

Trustworthiness

Merriam & Tisdell (2016) state, "All research is concerned with producing valid and reliable knowledge in an ethical manner" (p. 237). One way to produce valid and reliable knowledge is through triangulation. "…[*T*]*riangulation*…is a powerful strategy

for increasing the credibility or internal validity of your research" (Merriam & Tisdell, 2016, p. 245). The first method of triangulation was the use of multiple methods of data collection. Three methods of data collection were used in this study: interviews, observations, and documents. Data from one method was checked against the data of another method. The second method of triangulation was multiple sources of data. Comparing and cross-checking of interviews, observations, and documents occurred during the cross-case analysis. Follow-up interviews occurred during session five in order for participants to do a member check, meaning they checked the interview for correctness. A second member check occurred by sending a preliminary analysis to each participant for feedback. Lastly, to increase the transferability of the findings, rich, thick descriptions are provided.

Other ethical issues that have not already been addressed include reciprocity and risk assessment. Participants did not receive compensation for their time, although participants did learn how to use a new technology to compose. Learning to use this new technology could benefit participants who were unmotivated to write or had poor writing or handwriting skills. Additionally, it gave participants an alternative mode to handwriting or typing when doing writing assignments at school. The research study did not involve greater than minimal risk to the participants.

I taught at the site of the study. For the participants, it was made clear that the study had no bearing on their grades. One participant was in my classroom, but did not participant until after school was out for summer vacation. Two of the participants were in the same class as my daughter. The relationship to the participants could be

seen as a strength because a good rapport was already in place with each one. This

could have made the participants feel more comfortable during the study as well.

Chapter 4: Results

The participants in this study all came from the same private classical Christian school in a southwestern state. In 2016-2017, the district serviced almost 600 students, pre3-12th grade, over three campuses, and was accredited through AdvancED, and a member of the Association of Classical Christian Schools. The grammar school had a total enrollment of 359 students, pre-3 to 8th grade. Students at the grammar school were White (81.9%), Native American (4.7%), Bi-racial (3.9%), African American (2.8%), Asian (2.8%), Hispanic (2.2%), and Other (1.7%). Peniqua (third grader) and Sam (fourth grader) had attended the school since Prekindergarten. Trixie (fourth grader) and Johny (second grader) attended for the first time during the 2016-2017 school year.

Peniqua

Peniqua's mother met with the principal of the school to discuss the struggles her daughter faced in 3rd grade. The principal told Peniqua's mother about my study and her mother contacted me, requesting that Peniqua become a participant. As her mother explained Peniqua's struggles with writing, I realized she met the criteria for the study. Peniqua was a reluctant writer. Peniqua received handwriting instruction at school, using the *Classically Cursive: Ten Commandments Book II* handwriting workbook. Throughout the school year, she learned the Modern Cursive style of handwriting. Peniqua wrote with her right hand and used a lateral quadrupod grasp.

Peniqua's desire to have perfect handwriting was causing unnecessary stress and undermining her confidence in writing. The time Peniqua used to form the perfect letters when writing was affecting how she viewed herself as a writer. She stated, "I am

the slowest one in my class, because I am always the last one to get done. And even when I know the answers, I am the last one [because I] want to be neat." Before starting the first handwritten composition, Peniqua was concerned with having to write in cursive, as she did not like writing in cursive. I assured her that writing her composition in print was permitted.

Peniqua believed the most important characteristics of a writer included: being able to go over and check work, practicing, and thoroughly telling a story. She enjoyed writing about topics that interested her, but disliked having to handwrite, messing up, and not being neat. When writing, she wanted "to try to write without giving up to easily."

For Peniqua, Google Voice Typing was an alternative writing tool to help her write faster and avoid handwriting. When using Google Voice Typing to write, Peniqua felt "a little better than when…handwriting." She liked that Google Voice Typing allowed her to speak instead of handwrite, but found it difficult to edit. She stated, "…handwriting makes the spelling correct and doesn't misrecognize words but Google [Voice Typing] does." Despite feeling better about her writing, Peniqua communicated that she would probably not recommend Google Voice Typing to her friends, but would tell them about it "so they wouldn't have to [hand] write."

Peniqua wrote four compositions under four writing conditions via handwriting and Google Voice Typing, with a narrative guide and without a narrative guide. Peniqua scored her compositions using a rubric (Appendix C) and ranked (best to worst) each piece of writing based on the 6+1 Traits of Writing (Culham, 2003) (Table 3).

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Table 3

Peniqua's Composition Scores

Title of Composition	*Hail*	*A Way of Arguing*	*Zig-de-zag*	*Steve & Peniqua 2*
Mode	Handwritten, spontaneous	Handwritten with Narrative Guide	Google Voice Typing, spontaneous	Google Voice Typing with Narrative Guide
Genre	Expository	Narrative	Expository	Narrative
Rubric	4.5	6	5	5.5
Ideas	4th	2nd	1st	3rd
Organization	3rd-4th	1st-2nd	1st-2nd	3rd-4th
Voice	4th	2nd	1st	3rd
Word Choice	3rd-4th	3rd-4th	1st	2nd
Sentence Fluency	4th	1st-2nd	1st-2nd	3rd
Conventions	3rd	1st	2nd	4th
Presentation	3rd	4th	1st	2nd

Peniqua's first composition was an informational piece title, *Hail*. Peniqua gave *Hail* a score of 4.5 out of 6, explaining, "It was the first time I had done it by myself…I was sort of confused and sort of nervous at the same time." For her second composition, in which she used a narrative guide to plan, Peniqua gave *A Way of Arguing* a score of 6 out of 6. She expounded, "…this one I had a little more help and so it felt a little better." *Zip-de-Zag*, Peniqua's third composition, she gave a score of 5 out of 6 "because [it] didn't have any characters." She gave the fourth composition, *Steve & Peniqua 2*, in which she used a narrative guide to plan, a score of 5.5 out of 6.

Her reasoning for this score was "because the characters where kind of fresh and original. They were fresh and original at the same time. So it was basically balanced."

Peniqua wrote two expository and two narrative compositions. Her spontaneous writings became expository texts and the compositions planned with a narrative guide became narratives. She ranked the narratives higher than the expository compositions.

Ideas. When looking at what made up the content of each composition, Peniqua ranked the best to worst ideas in the following order: *Zig-de-zag*, *A Way of Arguing*, *Steve & Peniqua 2*, and *Hail*. *Zig-de-zag,* an expository text, was about a game Peniqua created. The composition presented details of how to play the game. As to her reason for ranking *Zig-de-zag* as the best idea, she stated, "I am actually making up something new." Peniqua used a narrative guide to develop and focus *A Way of Arguing*. The theme was 'arguing will bring trouble'. *Steve & Peniqua 2* was a different version of *A Way of Arguing* and was developed by using a narrative guide. Additionally, she ranked *Steve & Peniqua 2* as third because "I am using the same characters as this [*A Way of Arguing*]." *Hail*, an expository text, demonstrated Peniqua's knowledge about hail. Peniqua explained her ideas and presented facts throughout one paragraph. Peniqua ranked Google Voice Typing higher in ideas than handwriting, although it was a close second.

Organization. Peniqua ranked the structure, or organization, of each composition from best to worst in the following order: *A Way of Arguing* and *Zig-de-zag* (tie); *Hail* and *Steve & Peniqua 2* (tie). Peniqua explained, "These two [*A Way of Arguing* and *Zig-de-zag*] were pretty organized" and "not so much on this [*Hail*]." The organization for each composition was similar, one paragraph, with an introduction,

detailed sentences, and a concluding sentence. *A Way of Arguing*, a narrative, included an introductory sentence, six detailed sentences, and a concluding sentence. *Zig-de-zag*, an expository piece, organized as a description, opened with a question, included four detailed sentences, and a concluding sentence. Likewise, *Hail*, an expository piece, organized as a description, included an introductory sentence, three detailed sentences, and a concluding sentence. *Steve & Peniqua 2*, a narrative, included an introductory sentence, one middle sentence, and a concluding sentence.

Peniqua gave a tie for best organization with Google Voice Typing and handwriting. Also, using a narrative guide did not make a difference as one composition was spontaneous and one was developed with a narrative guide. Finally, each composition had a title that matched the composition and were all organized in one paragraph.

Voice. Peniqua ranked, from best to worst, how well her voice, or spirit, connected to the reader: *Zig-de-zag*, *A Way of Arguing*, *Steve & Peniqua 2*, and *Hail*. Peniqua liked to make up her own words when writing; therefore, she ranked *Zig-de-zag* as best voice, "…because it says fieldithingy." Peniqua's personality and awareness of audience was also seen in *Zig-de-zag*. It was created with the audience in mind, and explained to them how to play a new game and encouraged them to play at home. *A Way of Arguing* and *Steve & Peniqua 2* were about friendship, a familiar theme in stories at this age. The tone of an angry and moody friend was crafted throughout the story. Although *Hail* was an informative text, Peniqua's voice came through. She wrote with confidence by showing her knowledge of the topic, and she

concluded with a statement that connected to the reader, showing sincerity, "make sure you're safe!"

Peniqua ranked Google Voice Typing higher than handwriting, yet it was a close second. Her highest ranking did not use a narrative guide, but the second highest used the narrative guide to plan.

Word choice. Peniqua ranked her compositions on the best to worst word choice, based upon the use of rich, colorful, precise language, in this order: *Zig-de-zag*, *Steve & Peniqua 2*, *Hail* and *A Way of Arguing* (tie). Peniqua was unable to explain her reasoning for ranking the compositions in this order. Well-crafted words were found in each of her compositions. For example, in addition to *fieldithingy* in *Zig-de-zag*, Peniqua created the words *zigity-zags* and *zig-de-zag*. For *Steve &Peniqua 2*, Peniqua used vibrant verbs like *slammed* and *exclaimed* and in *Hail* she used *pitter-patters*. In *A Way of Arguing*, Peniqua used lively words like *chasing*, *grumpy*, *screamed*, and *stammered*.

Compositions created with Google Voice Typing received the highest rankings. Peniqua's Google Voice Typing compositions had around eighty words, as did her handwritten composition created with a narrative guide. *Hail*, Peniqua's first handwritten composition had about half as many words as the other compositions (Table 4).

Table 4

Total Number of Words, Sentences, and Paragraphs for Peniqua's Compositions

Title of Composition	Mode	Total # of Words	Total # of Sentences	Total # of Paragraphs
Hail	HWS	42	5	1
A Way of Arguing	HWNG	82	8	1
Zig-de-zag	GVS	89	6	1
Steve & Peniqua 2	GVNG	80	3	1

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Sentence fluency. When addressing the rhythm and flow of her sentences, Peniqua ranked her compositions in the following way: *A Way of Arguing* and *Zig-de-zag* (tie), *Steve & Peniqua 2* and *Hail* (tie). Although she gave a tie for first and second, she had this to say about *A Way of Arguing*, "I feel like I do that [sentence fluency] a little better when handwriting. I can…think and erase easier with handwriting than with Google Voice Typing." Peniqua used a variety of sentences in her compositions: *A Way of Arguing* had eight sentences (simple, compound, complex, and dialogue); *Zig-de-zag* had six sentences (simple, compound, complex, and compound-complex); *Steve & Peniqua 2* had three sentences (simple and dialogue); and *Hail* had five sentences (simple, compound, and complex). The flow of each composition made it easy to read out loud. The dialogue in *A Way of Arguing* and *Steve and Peniqua 2* sounded natural and added to each story. For example, in *A Way of Arguing*, to show the character

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stammered when talking, Peniqua wrote, "I…w-w-was…-g-going…to ask…y-y-you…if I…c-c-can play?"

Google Voice Typing and handwriting tied for best sentence fluency. The handwritten composition, using a narrative guide to plan, had the most sentences (8), while the Google Voice Typing composition, using a narrative guide to plan, had the least number of sentences (3).

Conventions. Peniqua ranked her compositions based on the best to worst use of standard writing conventions (e.g., spelling, punctuation, and capitalization) in the following order: *A Way of Arguing*, *Zig-de-zag*, *Hail*, and *Steve & Peniqua 2*. Peniqua ranked *A Way of Arguing* first because "with handwriting I can spell anything correctly any time I want and with Google Voice I have to correct it if it doesn't spell it right. When I try to say 'to' it puts the number down." Note: This is not a spelling error by Google Voice Typing but misrecognition.

Handwriting was ranked highest for conventions, followed by Google Voice Typing in second. For each composition, Peniqua made no errors in spelling or punctuation (Table 5). She made two errors in capitalization in the title of *A Way of Arguing*, a handwritten text.

Table 5

Errors in Conventions for Peniqua's Compositions

Title	Mode	Capitalization	Punctuation	Spelling
Hail	HWS	0	0	0
A Way of Arguing	HWNG	2	0	0
Zig-de-zag	GVS	0	0	0
Steve & Peniqua 2	GVNG	0	0	0

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Presentation. Peniqua ranked her compositions by best to worst presentation, how pleasing the final piece was to the eye, in this order: *Zig-de-zag* (Figure 1), *Steve & Peniqua 2* (Figure 2), *Hail* (Figure 3), and *A Way of Arguing* (Figure 4). When asked if her compositions looked different, she indicated, "A lot different." Peniqua added a title at the beginning of each composition, placing it in the center. All the titles were underlined except *Steve & Peniqua 2*, which was bolded and typed in all caps. For the handwritten compositions, Peniqua utilized the left margin and went across the right margin at times. She used legible and neat handwriting, but had several smudges. Peniqua chose a reader-friendly font (Arial, 11 point), sticking with the same font throughout each Google Voice Typing composition.

Peniqua ranked her Google Voice Typing compositions higher than her handwritten composition for presentation. When asked whether her handwritten or Google Voice Typing compositions had a better presentation, she stated, "Typed."

<div style="border:1px solid black; padding:10px">

    <u>Zig-de-zag</u>

There are games like tag, hide-and-seek, and duck duck goose, but have heard of zig-de-zag? When you play zig-de-zag, you run around in zigity-zags and try to chase the other person. Once you tag someone, that person has to run in a ziggety zag around the fieldithingy. After they run, they are "it" and they have to chase another person and it goes on, and on, and on, and on, and on again.It is a very fun game to play! Try zig-de-zag at home.
        The End!!!!!!!!

</div>

Figure 1. Zig-de-zag – Peniqua's first Google Voice Typing composition

<div style="border:1px solid black; padding:10px">

STEVE & PENIQUA 2

One Monday afternoon, at 1:42 p.m., Peniqua decided to go to Steve's house to play. On that cloudy day, Steve was very angry and so he said,"Hello. Go away. Bye", and slammed the door. Except, just before the door slammed, Steve's mom came in the room and exclaimed,"Don't yell at your best friend!!!", and she made Steve make up with Peniqua(because he almost slammed the door on Peniqua)and it was OK(FOR A WHILE).

    THE END!!!!!!

</div>

Figure 2. Steve & Peniqua 2 – Peniqua's second Google Voice Typing composition

Figure 3. Hail – Peniqua's first handwritten composition
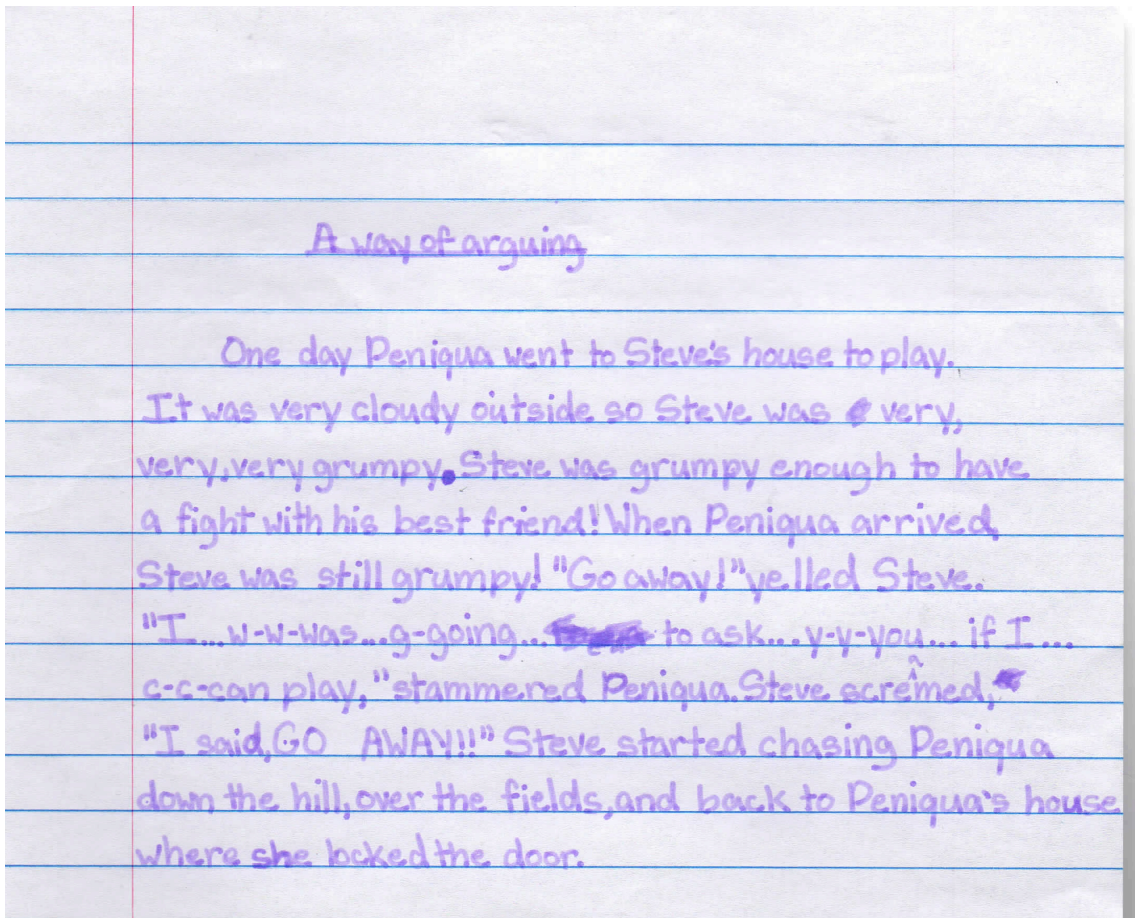
Figure 4. A Way of Arguing – Peniqua's second handwritten composition

In summary, the two compositions created with a narrative guide became narratives, and the two spontaneous compositions became expository texts. One narrative was handwritten and the other dictated using Google Voice typing, this was also the case with the expository texts. Peniqua scored the narratives higher than the expository compositions. Peniqua ranked Google Voice Typing higher than handwriting for best idea, voice, word choice, and presentation. When ranking Google Voice typing and handwriting for best organization and sentence fluency, she gave a tie. Peniqua ranked handwriting highest for conventions. Overall, Google Voice Typing received the best ranking (including the ties) for every writing trait but conventions.

Prewriting. As Peniqua began the first composition (spontaneous, handwritten), she asked, "Does it have to be long?" I reminded Peniqua she had about fifteen minutes for prewriting and drafting. She asked, "Can I first think about it?" I instructed her to think about what to write and then write down her thoughts. She was nervous, and I told her there was no pressure and to take her time and not worry about the timer, it was just to keep us on track. She looked around the room for about a minute and began writing with pencil and paper. For the most part, Peniqua went straight to drafting without spending much time thinking about what to write, brainstorming, or organizing.

Peniqua used a narrative guide to plan her second handwritten composition. She used a purple pen to fill in the narrative guide. I read through each section, defining and providing an example of each story element. Peniqua asked questions and I provided answers. For example, she inquired, "What does the time period mean?" As she thought, she balanced her chair on two legs. She wrote with her right hand, using her left hand to hold the paper in place. She added a title first and used very good handwriting, ensuring neatness. The narrative guide had no lines for her to write on. She stated, "I don't like writing without lines." So, I made lines for her to write on. Peniqua fidgeted with the pen lid in her hands and mouth. She had a great attitude and showed excitement when thinking up ideas. In the end, Peniqua created a plot with a conflict between two characters on a cloudy day, written in third person, and used dialogue. Peniqua planned for about 17 minutes.

The third composition was a spontaneous writing using Google Voice Typing. Peniqua was instructed to take about fifteen minutes to brainstorm and draft. She

admitted that she didn't know what to write about. We reviewed the story elements of a narrative and referenced several books in the classroom library. I instructed her to take a few minutes to think about what she wanted to write about. She said, "This is hard." I suggested thinking about something she could tell a story about. She sat and thought for about thirty seconds. She said games kept coming to her mind, so I told her to tell a story about a game. Peniqua spent a total of about three minutes on prewriting.

For the fourth composition, Peniqua planned for about 20 minutes using a narrative guide before dictating with Google Voice Typing. As Peniqua thought about what to write, she fidgeted quite a bit, playing with her hair, flipping it and running her fingers through it. I guided her through the narrative guide, asking her questions, probing her for ideas, and giving her examples. Although Peniqua did not look real excited, once she started she became focused and concentrated very hard. When ideas came to her mind, she used a purple pen to write them down. She stretched out her fingers and took breaks to think. At times her head was almost all the way on the desk as she filled out the narrative guide. Peniqua put the pen up to her mouth and when she stopped writing, she put the lid back on.

For Peniqua, the main difference in prewriting occurred when using a narrative guide and writing spontaneously. She spent more time planning when using a narrative guide. According to Peniqua, prewriting "gets better…because you can stop [Google Voice] when you're thinking."

Drafting. Peniqua found when drafting with Google Voice Typing, "You don't have to worry about being neat [and] it was easier and quicker." Because handwriting was a struggle for Peniqua, she was very concerned about having to write in cursive for

the handwritten compositions. When asked if she liked writing in cursive, she confidently replied, "NO!" She was assured that print was allowed if she preferred it to cursive.

For the first handwritten composition, Peniqua wrote for about nine minutes. At the beginning, she sat up straight with great concentration. She did not act agitated or unhappy but content in doing the writing. Peniqua wrote with her right hand and used her left hand to hold the journal she was writing in. At times she paused to think, putting her left hand to her cheek and then would start writing again. She took her time forming the letters, not rushing and erasing mistakes when needed. At one point, she popped her knuckles.

On the second handwritten composition, Peniqua wrote for about eighteen minutes, taking her time, writing steadily and continuously. Sometimes she thought out loud and other times she stopped when thinking. Peniqua remained focused, on task, and unhurried. Her attitude was good with no signs of frustration. Towards the end, Peniqua yawned and her head almost touched her hand on her desk as she wrote.

The third composition, using Google Voice Typing, took Peniqua about two and a half minutes to draft. As she dictated, Google Voices Typing made errors, with misrecognitions and punctuation. Although I reminded her not to worry about errors at this time, she continued making edits while drafting. For example, Peniqua said, "Zig-de-zag" but Google Voice Typing dictated "Ziggety zag", so she corrected it before moving on. She made other edits while drafting, using typing and the 'select' command. At one point, Peniqua deleted an entire section. Once again, I reminded her to just tell her story and not worry about editing or revising. I also reminded her to turn

the microphone off while thinking, otherwise unwanted words could appear on the screen. When she finished, she proudly and happily announced, "The End" with a big smile on her face. Peniqua had about ten minutes left to draft, so I asked if she wanted to add any details and she shook her head no.

For the fourth composition, as Peniqua started the draft, I reminded her to not worry about spelling or making corrections, but to concentrate on getting her thoughts down. She held on to the microphone as she spoke clearly and consistently. Peniqua told the story orally just as if she were telling it out loud to someone. She looked at the computer screen and her narrative guide as she spoke the story. At times her head went down, possibly making it hard for Google Voice Typing to understand what she was saying because a few words and punctuation marks were misrecognized. She took about one minute and thirty seconds to draft her story.

Peniqua spent less time drafting her Google Voice Typing compositions than her handwritten compositions (Table 6), although she drafted more words per minute when using Google Voice Typing. She drafted her handwritten compositions with a purple pen on notebook paper and the Google Voice compositions with her voice.

Table 6

Total Drafting Times for Peniqua's Compositions

Composition	Mode	Drafting Time (in minutes)	Total # of Words on Draft	Words per Minute
Hail	HWS	9	38	4
A Way of Arguing	HWNG	18	82	5
Zig-de-zag	GVS	2.5	50	20
Steve & Peniqua 2	GVNG	1.5	76	51

Note. Total # of Words on Draft / Drafting Time = Words per Minute (Rounded to nearest whole number); Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Revising/Editing. For the most part, revising and editing happened simultaneously. When revising and editing with Google Voice Typing, Peniqua stated,

> You can just do it on the same sheet of paper [without] having to do another
>
> whole different sheet of paper for a final draft. You can just do it and be done
>
> and on the other one [handwriting] you just have to write down what you have
>
> on that piece of paper.

In other words, with Google Voice Typing Peniqua made revisions and edits on her draft, which automatically became the final draft. With the handwritten composition, she handwrote the revisions and edits on the draft and then had to rewrite the entire draft for publication. An entire step was eliminated when revising and editing with Google Voice. Additionally, when editing with Google Voice Typing Peniqua stated, "You can do certain things that you can't [with handwriting]…like italics."

Before revising the first handwritten composition, Peniqua read the story out loud. We discussed if she left out details or if there were any changes she needed to make. She said, "a lot more." She asked if I was timing her and I told her she was not being timed but the timer was used to keep us on track. After Peniqua read the first sentence, she used a thesaurus to make a synonym change. She used a purple pen to mark the changes on the paper. Peniqua made word changes and added, combined, and deleted sentences. The composition had no spelling, punctuation, or capitalization errors. Peniqua revised and edited for about nineteen minutes.

Peniqua did not revise or edit her second handwritten composition.

Before revising and editing her third composition, Peniqua read her composition out loud. Then she used Google Voice Typing to add two additional sentences to explain the game, and used typing to insert additional words. Throughout the revision and editing process, Peniqua was very engaged, focused, and on task. She took about fourteen minutes for both revising and editing on the actual Google document. Once all revisions and edits were completed, the document was ready for immediate publication.

For the fourth composition, Peniqua used typing to make revisions. I referenced the narrative guide and pointed out ideas she had written but didn't include in her story, so she added a specific time and weather. We discussed the beginning, middle, and end and if she had each part of the story. She pointed out that she had one sentence for each part- beginning, middle, and end. As she went through each sentence to revise, I asked her questions about the story to help her think of ideas. In the end, she added a few details to each sentence. When editing, Peniqua used typing and placed the cursor where she wanted to make a correction, mostly misrecognitions, capitalizations, and

punctuation. She also used the mouse to highlight and edit words. For example, when Google Voice Typing dictated the words 'exclamation point' instead of the symbol (!), Peniqua highlighted the words and replaced them with the symbol. She added quotation marks to the dialogue and corrected the spelling of Peniqua. She was very focused. When she finished, she added a title at the beginning and bolded it. Peniqua spent about twenty-three minutes revising and editing.

Peniqua used a pen to revise and edit her handwritten compositions and her voice or typing for her Google Voice Typing compositions. All revisions and edits happened on the rough draft.

Publishing. When it came to publishing with Google Voice Typing, Peniqua revealed, "I don't have to be as neat." Having neat handwriting was a big concern for Peniqua and Google Voice Typing allowed her to not worry about neat handwriting. To begin with, Peniqua's first handwritten composition was published with a purple pen. It took her about five minutes to rewrite her final draft and she wrote the entire time without taking a break. She mostly sat up while writing, but bent over some too. Her grip was very tight as she wrote. Upon completion, she reread the composition out loud with the new corrections. Again, for the second composition, Peniqua read back her story out loud to me. As she read, she had great expressions, using voices for each character. To publish the third composition with Google Voice Typing, I printed the composition for Peniqua. After she finished, we went over the narrative rubric to see if she wrote a narrative but decided based on the rubric she actually wrote an informational piece. The fourth composition, used with Google Voice Typing was printed from the computer.

Peniqua discovered how easy it was to publish with Google Voice Typing. She stated, "You don't have to do a whole new sheet and paragraph. [With handwriting], you have to make corrections and then do a whole other [sheet]." Peniqua also discovered,

> [It looks] a lot different. Almost every time [when handwriting] I have to do it in cursive, this lets me do it in print. It lets me italicize, color, and bold. It looks so neat here [Google Voice Typing] but I want to be neater when I use handwriting.

Attitude survey. Peniqua took the Elementary Writing Attitude Survey (Kear et al., 2000) before using Google Voice Typing and after using Google Voice Typing to give a pre- and posttest measurement score of her attitude towards writing. Although her percentile rank for both the pretest (12th percentile) and posttest (30th percentile) fell below the national norm (50th percentile rank), her attitude improved somewhat towards writing. Because a score at or above the national norm was indicative of a positive attitude towards writing, Peniqua had a somewhat negative attitude towards writing. According to Peniqua, her attitude "improved a tiny bit" because she "…could write without having to [hand]write" and Google Voice Typing provided her an alternative writing tool. Additionally, Peniqua shared that she "feel[s] a little more confident" when composing with Google Voice Typing.

Trixie

Trixie's mother contacted me after receiving a flier about this study. Her mother felt that learning to use Google Voice Typing could give Trixie an alternative writing tool. Trixie was a reluctant writer, meaning she lacked the motivation to write when

handwriting. As a fourth grader, Trixie no longer received handwriting instruction at her school. She wrote with her right hand, with a lateral quadrupod grasp.

Trixie believed the most important characteristics of a writer included "being able to write down ideas, making stories, and being creative." Trixie did not see herself as a writer but as an artist. The physical aspect of writing was painful for Trixie, making her feel frustrated, yet she enjoyed the creative aspect of writing. She admitted,

it hurts my hand because I end up holding the pencil the wrong way.

[Although], I enjoy that this is your idea and it feels like nobody can stop you from writing this, it's just the thing you are doing. It is something that you are doing, not anybody else is doing.

Because handwriting was physically and emotionally painful for Trixie, Google Voice Typing relieved some of the stress. For her, Google Voice Typing "makes writing easier, because you're not actually [hand]writing, [but] voice writing, voice typing." When using Google Voice Typing, she stated,

I like that you don't have to hurt your hand and it just makes it easier. I have problems forgetting it as I'm writing it and Google Voice Typing just says it.

You can just say the things then go back and put in punctuation.

Trixie found that saying the punctuation when dictating with Google Voice was difficult. "I am not used to saying the actual punctuation part. Blah, blah, blah 'period', I am not used to saying that. And it is hard for me to say exclamation point."

Trixie wrote four compositions under four writing conditions via handwriting and Google Voice Typing, with a narrative guide and without a narrative guide. Trixie

scored her compositions using a rubric (Appendix C) and ranked (best to worst) each piece of writing based on the 6+1 Traits of Writing (Culham, 2003) (Table 7).

Table 7

Trixie's Composition Scores

Title of Composition	*On the Night Before Christmas*	*Joy in Shangri-La*	*Myths*	*Martians*
Mode	Handwritten, spontaneous	Handwritten with Narrative Guide	Google Voice Typing, spontaneous	Google Voice Typing with Narrative Guide
Genre	Narrative	Narrative	Expository	Narrative
Rubric	4	5	4.5	6
Ideas	4th	2nd	3rd	1st
Organization	2nd	3rd	4th	1st
Voice	3th	4th	1st	2nd
Word Choice	4th	3rd	2nd	1st
Sentence Fluency	2nd	4th	1st	3rd
Conventions	3rd	4th	1st	2nd
Presentation	3rd	4th	2nd	1st

Trixie's first handwritten composition was a narrative titled, *On the Night Before Christmas*. She gave the composition a score of 4 out of 6. She explained, "I'd used that story before. I haven't had a lot of fresh characters in the actual story and I wasn't really taking the time because I said 'long story short'." The second handwritten

composition *Joy in Shangri-La*, Trixie used a narrative guide to plan. She scored it a 5 out of 6 because "I personally think that the *Joy in Shangri-La* is better because I hadn't written it before." The third composition, using Google Voice typing, Trixie scored *Myths* a 4.5 out of 6. She explained, "I stayed focused on my topic when I was developing it but I did not have all my answers for my reasons. I gave an overview of my topic. It was like really a 4 but a little bit of a 5." The fourth composition, using Google Voice Typing and a narrative guide to plan, Trixie scored *Martians* a 6 "because it was the best story ever. [It is] the best story I've ever made in my life. Even if it's just what, two paragraphs? It was really like the best story I've written."

Trixie wrote three narratives and one expository composition. She ranked the narratives, planned with a narrative guide, higher than the spontaneous compositions.

Ideas. When looking at what made up the content of each composition, Trixie ranked the best to worst ideas in the following order: *Martians*, *Joy in Shangri-La*, *Myths*, and *On the Night Before Christmas*. *Martians* was ranked first "because it's something you want to hear and it's fun because it's on Mars. It's a Martian that saves Mars, like saves the planet, saves everyone because she remembers things and studies things. It's just something you want to hear." *Joy in Shangri-La* was ranked second because "it's just something you'd want to listen to" and *Myths* was ranked third because it "…doesn't answer all the questions a reader would ask." Trixie ranked *On the Night Before Christmas* fourth because

> *Night Before Christmas* is like the same as Ebenezer Scrooge. A lot of people
>
> have read that [and] know what it's all about. [They might] say this [does] not

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[have] all the facts and what does 'long story short' [mean]? [It] doesn't tell all

the information.

Trixie scored the narratives, planned with a narrative guide, higher than spontaneous

compositions for ideas.

Organization. Trixie ranked the structure, or organization, of each composition

from best to worst in the following order: *Martians*, *On the Night Before Christmas*,

Joy in Shangri-La, and *Myths*. *Martians*, a narrative, was organized into two

paragraphs. Trixie stated,

I put *Martians* first because it's organized. It has a title [and] a little

blurb…'Lyla was just an ordinary Martian, until one day'. Which if it were a

book, this would be on the front of the page to make you want to read it because

it's like a miniature cliffhanger. Then it has the body, which [is] interesting like

'Lyla hears the siren'. It has an ending, which is 'The End'. So that's why I

have that in first place.

On the Night Before Christmas, a narrative, was ranked second because "it has the title,

the body, and ending." More specifically, it was organized into a beginning paragraph,

three middle paragraphs, and a closing paragraph. *Joy in Shangri-La*, a narrative, had a

beginning paragraph, middle paragraph, and a closing paragraph. Trixie put *Myths* in

fourth "because it doesn't have all the answers." *Myths*, an expository text, included

four paragraphs, a beginning paragraph, two middle paragraphs, and a closing

paragraph.

Each composition included a title that matched the composition. Trixie ranked a

Google Voice composition, with the least amount of paragraphs, as the best for

organization. It was followed by a handwritten composition that had the most

paragraphs.   When asked about organizing her compositions, Trixie shared this,

> Well, I will say it is harder to fix the handwritten because with Google Voice
>
> Typing all you have to do is go back where you need to fix it [or] delete it. You
>
> have to write the entire new story or erase it, which makes it not look so nice
>
> [when] writing with your actual hand.

Voice. Trixie ranked, from best to worst, how well her voice, or spirit,

connected to the reader in this order: *Myths*, *Martians*, *On the Night Before Christmas*,

and *Joy in Shangri-La*. Trixie only shared her reasoning for giving *Myths* a first place

score, "I just pick it because it really has the things I say and it shows that I'm a

humorous person. It shows the emotion that I feel when I'm saying it." In *Myths*,

Trixie showed her personality when adding unrelated facts to the story intentionally,

which she believed made the composition more interesting and because she likes when

stories have unrelated facts built into them. Throughout *Myths*, Trixie's only expository

text, she demonstrated her knowledge of myths by including several facts and details

about the mythical gods and goddesses. For *Martians*, Trixie's theme of solving a

problem came through in the story, as did the tone of a scary situation and the

excitement of saving a planet. *On the Night Before Christmas*, the Christmas spirit was

crafted throughout the story as Trixie told her version of the familiar story of Ebenezer

Scrooge. Trixie included a moral in *Joy in Shangri-La*: moods are contagious, which

flowed nicely with the theme of finding joy.

Trixie ranked Google Voice Typing compositions higher than handwritten

compositions for voice. When adding personality to a composition, Trixie

communicated, "I feel like I'm a different person, I can just be anything cause it's making something people like to read."

  Word choice. Trixie ranked her compositions on the best to worst word choice, based upon the use of rich, colorful, precise language, in this order: *Martians*, *Myths*, *Joy in Shangri-La*, and *On the Night Before Christmas*. Trixie told about how she learned from her teacher not to repeat the same word over and over and to dress up her compositions. *Martians* was ranked first because she chose precise words like *ordinary* or *grabbed* and used synonyms for words "so it's not the same word being repeated." For example, one time Trixie used the word *cure*, and the next time she used the word *antidote*. Trixie did not know why she put *Myths* in second for word choice, yet she was familiar with the names of the gods and goddesses like Cronus, Zeus, Poseidon, Hades, Hera, and Persephone. For *Joy in Shangri-La* Trixie stated, "I got to make up new words and so it got to be any word. It could be Leebala, that's not a real word or real name. Same as Abalabalabaaa, [it] is also not a real name." *On the Night Before Christmas* was "put in last place because I've written it before." In it, she used vivid words such as *grumpy*, *friendly*, and *stuck*.

  Compositions created with Google Voice Typing included more words than handwritten compositions (Table 8). For Trixie, these compositions were also ranked the highest for word choice.

Table 8

Total Number of Words, Sentences, and Paragraphs for Trixie's Compositions

Title of Composition	Mode	Total # of Words	Total # of Sentences	Total # of Paragraphs
On the Night Before Christmas	HWS	81	7	5
Joy in Shangri-La	HWNG	62	8	3
Myths	GVS	165	16	4
Martians	GVNG	147	10	2

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Sentence fluency. When addressing the rhythm and flow of her sentences, Trixie ranked her composition in the following way: *Myths*, *On the Night Before Christmas*, *Martians*, and *Joy in Shangri-La*. She stated, "I like this book [*Myths*] because it's interesting…and like a miniature book. It gets to the point…and has the most punctuations that are different." *Myths* included sixteen sentences (mostly simple, a few compound). *On the Night Before Christmas* was chosen second "because it has a [phrase] I use sometimes, which is 'long story short'." *On the Night Before Christmas* included seven sentences (simple, compound, and dialogue). Trixie ranked *Martians* in third, "because it's not the best. I used words that don't really make sense in the paragraph [to explain] the way to stop the storm." *Martians* included ten sentences (simple, compound, and complex). Lastly, *Joy in Shangri-La* was ranked fourth

"because it was not the best out of them." *Joy in Shangri-La* included eight sentences (mostly simple, complex).

Trixie ranked Google Voice Typing with the best sentence fluency, which included the most sentences but not the best variety of sentences. Overall, compositions created with Google Voice Typing had more sentences compared to handwritten sentences.

Conventions. Trixie ranked her compositions based on the best to worst use of standard writing conventions (e.g., spelling, punctuation, and capitalization) in the following order: *Myths*, *Martians*, *On the Night Before Christmas*, and *Joy in Shangri-La*. Trixie shared this idea, "Google Vice is harder because with handwriting you just draw the dot or question mark [and] with Google you have to say it. Spelling, spelling, I give Google Voice a point because Google Voice doesn't have misspellings at all."

Trixie ranked Google Voice Typing with the best conventions. *On the Night Before Christmas*, a handwritten composition, had the most spelling errors. *Martians*, dictated with Google Voice Typing, had the most punctuation errors. *Myths*, dictated with Google Voice Typing, and *Joy in Shangri-La*, handwritten, had the most capitalization errors. Overall, handwriting had more spelling and capitalization errors, and Google Voice Typing had more punctuation errors (Table 9).

Table 9

Errors in Conventions for Trixie's Compositions

Title	Mode	Capitalization	Punctuation	Spelling
On the Night Before Christmas	HWS	1	1	5
Joy in Shangri-La	HWNG	2	1	3
Myths	GVS	2	1	2
Martians	GVNG	0	2	2

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Presentations. Trixie ranked her compositions by best to worst presentation, how pleasing the final piece was to the eye, in this order: *Martians* (Figure 5), *Myths* (Figure 6), *On the Night Before Christmas* (Figure 7), and *Joy in Shangri-La* (Figure 8). When making the final copy look presentable, Trixie had this to say, "Google Voice has a better presentation, because [there are] no spelling errors it's like the first draft, perfect draft. It looks neater." She ranked *Martians* first and *Myths* second because "I just like the way it looks." *On the Night Before Christmas* was ranked third because her handwriting was "clearer" and *Joy in Shangri-La* was ranked fourth because "when I am getting tired my cursive, my l's, get real loopy and tall."

Trixie ranked the Google Voice Typing compositions higher in presentation than the handwritten compositions. For the handwritten compositions, Trixie wrote the titles at the top of the notebook paper in larger letters. She utilized the left margin and at times crossed the right margins. She wrote in cursive, which was mostly legible. The title of *Martians* was underlined and typed in Arial 96 point font, the first line was typed in Aria 24 point font, and the body was typed in Arial 12 point font. For *Myths*,

Trixie used a Times New Roman 96 point font in all caps, and the body of the composition was typed in Arial 11 point font.

Martians

Lila was just an ordinary Martian, until one day..

Lila heading home from Rock School when the storm hit.First, she heard the siren, then she saw the storm. She ran home as fast as she could, so she could figure out how to stop it. If she got home quick enough, she might be able to find a cure for the the sandstorm. She knew it would be very hard, but she didn't know any other way.

When she got home, she went into her lab and grabbed some sand stones. At school, she learned all about rocks and so she thought she might be able to stop the storm. After two minutes, she finally found a way to stop the sandstorm. She sent the Inter National Weather Service the antidote and the service sent the news to everyone else. 3 seconds later , everyone was safe.

The End.

Figure 5. Martians – Trixie's second Google Voice Typing Composition

MYTHS.:)

       Hello, I am here to tell you about the Greek Gods and Goddesses! First, let me tell you about the Big Three. The Big Three are sons of Kronus. The Big Three are Zeus, Poseidon, and Hades. Zeus is the ruler of the gods and goddesses. Zeus had a wife, whose name was Hera. Zeus and Hera are the parents of most of the other gods and goddesses. I like kangaroos.

       Poseidon is the father of Percy Jackson. Did you know, that Poseidon, in the Roman form, was the also the god of earthquakes?

       Persephone was the daughter of Hades. Hades was not the God of the underworld, he was the ruler of the underworld.

       The Big Three refuse to have mortal children . Kangaroos have big feet. There may not seem like a lot of gods and goddesses, but there are a lot of minor gods and goddesses. Did you know that the big three were the only children that were not eaten by Kronus?

Figure 6. Myths – Trixie's first Google Voice Typing composition.

On the Night Before Christmas

Once upon a time in London, there was a grumpy man named Ebenizer Scrooge. He was always mean, but during Christmas Season, he was just cruel.

On Christmas Eve night, three ghost visited him. Long story, the ghosts visited one at a time, warking him to be more friendly.

In the morning Scrooge stuck his head out the window and yelled to a caraller boy, "What day is it?" The boy answered, "Christmas!" Scrooge, for the first time ever, was happy!

The End

Figure 7. On the Night Before Christmas – Trixie's first handwritten composition

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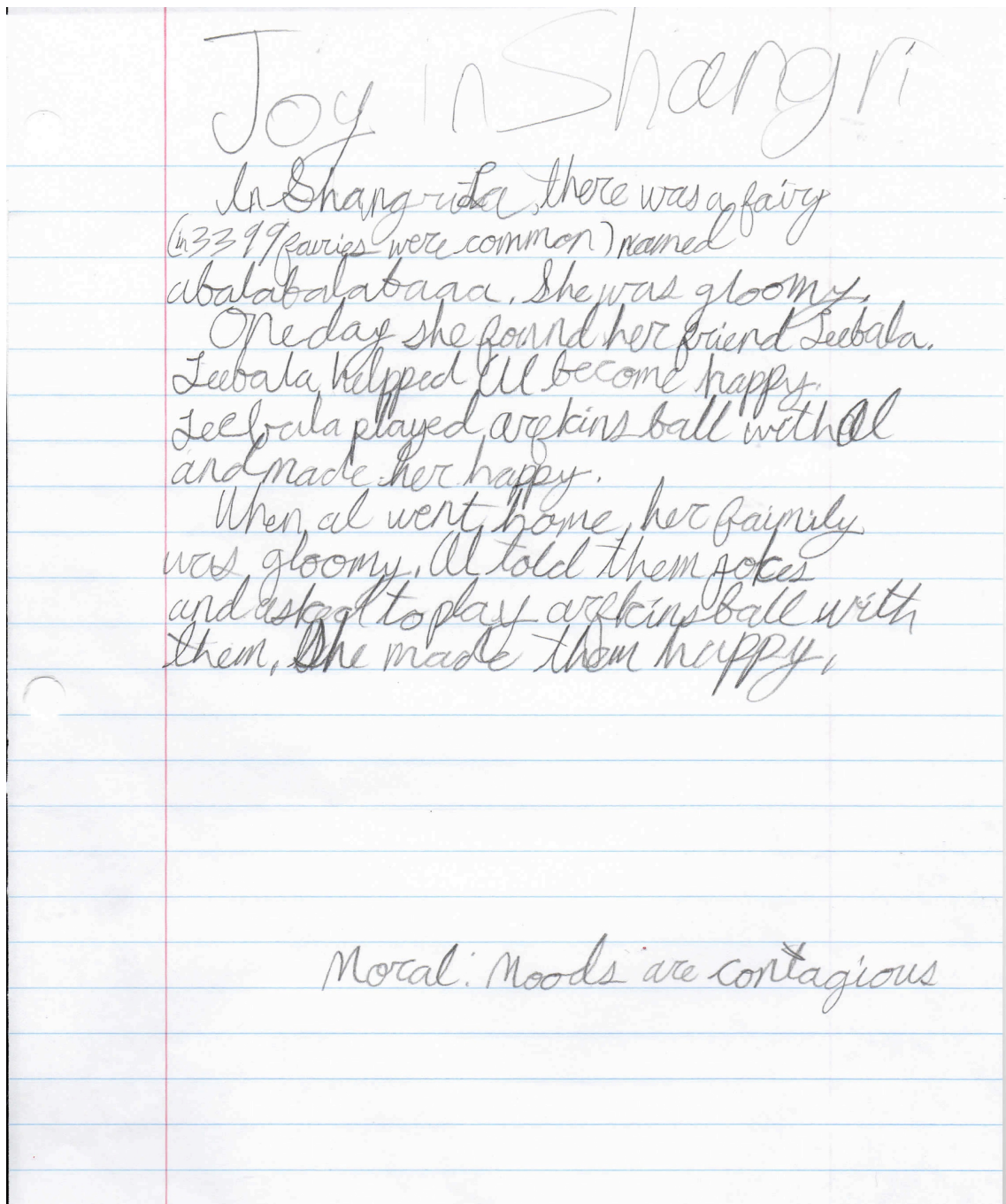
Figure 8. Joy in Shangri-La – Trixie's second handwritten composition

In summary, Trixie wrote three narratives and one expository text (a spontaneous writing using Google Voice Typing). Trixie gave the highest score to Google Voice Typing, with a narrative guide. Trixie ranked Google Voice typing

higher than handwriting for ideas, organization, voice, word choice, sentence fluency, conventions, and presentation. In other words, Google Voice Typing out scored handwriting for every writing trait.

Prewriting. Trixie was hesitant to start writing the first spontaneous composition. After explaining the assignment to Trixie, she commented, "That's why I'm in this class, because I can't do that." She placed her hand over her face as if defeated. Trixie needed a lot of reassurance and encouragement, as she was not confident in her ability to come up with an idea on her own and became somewhat frustrated. She was given the choice of writing with a pen or pencil, and she chose a pencil. Trixie was told the timer would be set for fifteen minutes, not to time her but as a way to keep us on track. After hearing that she had fifteen minutes to write whatever came to her mind, she said, "It'll take me fifteen minutes to find out what to write." After a few minutes of encouragement, she started writing.

For prewriting on the second composition, Trixie used a narrative guide to plan her composition. I explained each section of the narrative guide to Trixie as she filled it out, which took about nine minutes. Trixie was receptive to the planning part and had many great ideas. She had a smile on her face as she planned a plot, with a theme of finding joy, a conflict between two characters, and told in third person.

After the training session, Trixie began her third composition. For the planning process, she turned on the microphone in Google Voice Typing and began dictating an outline of her story (Table 10). As Trixie outlined her narrative, she used features such as underline, select, deselect, next line, and capitalize. She also used the edit, undo feature. Trixie tried to use dictation to highlight but found that it was not a feature on

Google Voice Typing. When Google Voice Typing continued to misrecognize the

spelling of Hera, Trixie typed the spelling she wanted to use. One time she turned on

the microphone while talking to me, and it recorded her words she meant for me. Trixie

highlighted that portion with her cursor, using the mouse and deleted it. She asked for

help inserting a table to organize her outline, so I showed her how to insert a table.

Table 10

Trixie's Google Voice Typing Outline-Composition #3

Main topic

Rome

Gods and Goddesses

Names and history

List Of Names	History
Zeus	Zeus, Poseidon, Hades -Big 3
Poseidon	Hera- Zeus's wife
Hades	
Hera	

Trixie used a narrative guide when planning her fourth composition. As she sat

at a student desk, Trixie talked out loud while planning and asked for clarification of

items in the narrative guide. I explained each part as she planned a plot, with a theme of

solving, a conflict between a character and society, and written in third person. After a

few minutes she asked for help testing Google Voice Typing to see if it would spell the

name of her character correctly. When it did not spell it correctly, she used the select delete command. Trixie struggled to stay on task, spending about ten minutes on prewriting.

When planning out her compositions, Trixie felt better about using a narrative guide. She stated,

These two [without narrative guide] are not as good because it's just writing. But with those [with narrative guide], I like those better because they were planned out. So, when you were thinking them out and planning them out you could have found something, like 'I don't like that' and you could just fix it.

One the first spontaneous writing, in which Trixie did not have a narrative guide, she went straight into drafting. One the second spontaneous writing, Trixie created an outline before drafting.

Drafting. After about twenty seconds of writing her first draft Trixie said, "Wait, I am using a story and turning it into my own words. Is that okay?" I said, "Perfect." As she wrote, she bent her arm to her forehead and rested her head on the palm of her hand and used her elbow to hold her paper in place. She concentrated as she worked with no distractions. She asked how to spell words, but was told not to worry about spelling during this time, to just concentrate on writing, getting her thoughts down on paper, and we would correct errors later during editing. She kept the pencil moving the entire time. As she wrote, her hair fell in her face, and at times she would push it out of the way. I let her know when she had ten minutes and then five minutes left to write. With just a few minutes left, she announced that she was done.

Trixie was given fifteen minutes to draft her second composition. During this time, she ate a sucker while she wrote. She wrote happily and continuously at first. A few minutes into writing, she asked one question for clarification. After about five minutes of writing, she announced that she wanted to have two characters. She added the name of the character to the narrative guide and began writing again. As she wrote, she looked at the narrative guide. Eight minutes into the writing, she stopped, got up out of her chair to move around and began making faces at the camera. She was growing weary of writing and asked, "What time are we done?" Trixie was told she had about seven more minutes to finish her rough draft. She asked, "How long have I been here already?" I told her two hours. She took a long drink from her water bottle, took a bite of her apple, and started writing again. I encouraged her to concentrate on finishing her story as she only had about five minutes left. She wrote one paragraph and did not want to write any more.

Trixie dictated her third composition using Google Voice Typing. On the first sentence Trixie admitted, "I can't say exclamation point right, and if I do it [Google Voice Typing] won't understand it, so I'm just going to [type it]." I showed Trixie how to use the shift key to type an exclamation point. At first, Trixie dictated word by word, not in a regular rhythm as she was shown in training. Yet, the further she got into her composition, the better she became at dictating. In addition, I reminder her, she could turn off the microphone while she thought, so Google Voice Typing would not record her voice as she thought out loud. She turned off the microphone and orally drafted her story and then turned on the microphone and dictated her thoughts. Trixie wanted to revise spelling errors as she drafted, but was reminded not to worry about revising until

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after her draft was written. If Google Voice Typing made an error, she used typing to correct the mistake. Google Voice Typing spelled "Hera" a different way, so Trixie corrected it by typing and the next time she dictated "Hera" Google Voice Typing wrote it correctly. While drafting, Trixie decided to make character changes, so she scrolled up to her outline and deleted characters she no longer wanted to include in her story. At one point she got up from her seat and went to a Greek Myth book to check her facts. I gave her a four minute and a two minute warning. She said, "Every once in a while I am going to give a fact about Kangaroos. What's a story without some comedy?" It seems she did this when she had writer's block.

Before drafting her fourth composition, Trixie gave it a title. When she first spoke the title '*Martians*' Google Voice Typing misrecognized it as 'missions'. Trixie used the 'select delete' command and dictated again, speaking clearly, and it worked the second time. She decided she wanted the title in a larger font, so I showed her how to change the font size, underline, and center the title. She also made the first sentence a bigger font than the rest of her story. This time, Trixie dictated in sentences, not word by word. She turned the microphone on and off in between her thoughts and dictation, and Trixie included punctuation as she spoke. Trixie had a hard time not revising and editing as she spoke, so I reminded her at several points throughout the draft that the goal was to get her words down. She commented, "But I want this to be the first thing." We talked about how she sometimes forgot what she wanted to say and how it could be because she was trying to edit and revise while drafting. Upon learning this, she exclaimed, "Oh! Okay!" like she agreed with me. At times, Google Voice Typing spelled out her punctuation instead of placing the punctuation in the sentence. For

example, if she said 'comma' Google Voice Typing wrote 'comma' instead of putting

the symbol (,). She used the 'select delete' command to make corrections as well as

typing. Drafting took a little over ten minutes. When she finished, she announced, "I

am ready to print."

   Trixie was asked if there was a difference in getting her thoughts down when

handwriting verses Google Voice Typing. She explained, "Yea kind of. Sometimes I

can say things when I'm thinking them." When drafting her handwritten compositions

Trixie stated, "If it came to my mind, I wrote it down…with a pencil" and with Google

Voice Typing, "I said the story." For the first three compositions, Trixie drafted about

the same number of words per minute. Yet, on her last composition using Google

Voice Typing, Trixie drafted about twice as many words per minute as the other three

compositions (Table 11).

Table 11

Total Drafting Times for Trixie's Compositions

Composition	Mode	Drafting Time (in minutes)	Total # of Words on Draft	Words per Minute
On the Night Before Christmas	HWS	11	85	8
Joy in Shangri-La	HWNG	11.5	64	6
Myths	GVS	19	134	7
Martians	GVNG	10	153	15

Note. Total # of Words on Draft / Drafting Time = Words per minute (Rounded to nearest whole number); Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Revising/Editing. During the revision stage for the first composition, I worked closely with Trixie, sitting next to her and going through her entire story line by line as she made corrections with a red pen (her choice). Trixie made two paragraph changes but was adamant about not adding anything to her composition. When editing, she read the sentences aloud and made a few spelling corrections. At times, she kept her head rested on her hand. Upon completion of editing, I asked her one last time if she would like to add anything to her story and her comment was, "It's like a summary of a summary of a story."

When revising and editing the second composition, we went over Trixie's narrative guide, making sure she included all the information. After showing her that she left out details to the middle of her story, she orally conveyed what she wanted to write. I encouraged her to write exactly what she just said into her story and she said, "But that's too descriptive. It would be a hard time to rewrite that stuff." I assured her not to worry because she was going to get a break before she wrote her final draft. As she wrote, she orally spoke what she wanted to write. When she finished, she read aloud the story. Next, we discussed that her narrative was missing an ending, so she took about two minutes and added an ending. She orally read the narrative again. At the end of the reading she excitedly said, "Eww, this could be a parable and I could put the moral…Moods are Contagious." She eagerly added the moral to the end. Then, she edited her narrative with a blue pen so she could easily see her corrections. Trixie corrected two spelling errors. It was pointed out that Trixie used the word happy three times and she was asked if she would like to make a synonym change. Trixie exclaimed, "Nope! I have 'happy' that many time for a reason."

As Trixie revised, I asked her about the random facts that she put in her composition and if she needed to keep them and she responded, "Yeah, I like books with a little random facts." Trixie was taught how to cut and paste sentences in different places, as she wanted to move a sentence in a different location. I pointed out that she wrote three sentences on Zeus, and only one sentence about Poseidon and Persephone, so she added one sentence to each one and made two new paragraphs. When editing, I asked Trixie questions like "What do you do at the beginning of a paragraph?" She would then indent her paragraphs. She also went through and made capitalization corrections. For whatever reason, when there was a period, there would be an extra space, so Trixie went through and corrected those spaces.

For the fourth composition, Trixie was asked to read each sentence out loud and decide if it needed changes. She made one word change, but no other revisions. Trixie edited by typing and made capitalization, punctuation, and indention corrections. After she read through her story, I asked her if she needed to add anything else and she responded, "No, I like the story the way it is. Can you print it?" Revising and editing took about four minutes.

Trixie shared these differences when revising and editing with Google Voice verses handwriting. With Google Voice Typing, "I type it or say it. I just had to go back and fix it. And it didn't even leave pencil marks!" When revising and editing the handwritten compositions, Trixie stated, "I can make it more clearer, make sure it makes sense, and answer questions."

Publishing. For publishing her first handwritten composition, Trixie was given a choice to use notebook paper or construction paper and a pen or pencil. She chose

notebook paper and a pencil expressing, "Pencils make it neater." Trixie added a title at the top of her composition, yawned and stretched real big, and began handwriting her final draft. As she wrote, she placed her left hand under her chin while writing with her right hand. The draft was to her right as she copied word by word on her final draft. Trixie wrote a line, paused the writing, and started chatting with me. A few minutes into writing, she got up, walked around, sharpened her pencil, and grabbed an apple to snack on while writing. She wanted to get her lunch, but I told her as soon as she finished her final draft, we would take our lunch break. The task of rewriting her entire draft was overwhelming. She was encouraged by statements like, "you are doing great" which helped her to continue working hard. After about ten minutes she said, "I want to go to sleep." She took little breaks, resting her hand and talking to me. Her left hand moved up to her forehead, at one time covering her eye. After twelve minutes of writing, Trixie pushed her paper to the side and announced she was finished, but she really was not. She was just ready for lunch. I encouraged her to complete her first composition, as she was almost finished. She said, "How about I take a nap and then finish it?" I guided her sentence by sentence, offering encouragement and assistance along the way. Trixie continued to take little hand breaks and after about twenty minutes, she finished her writing and rated the composition.

Before starting her second handwritten final draft, Trixie took a walk, got a drink of water, and read a Dr. Seuss book. Again, she chose to write the final draft with notebook paper and a pencil. She took about ten minutes to write her final draft. She struggled to get it copied, so we did a countdown of the number of lines she had to write. She had a total of eleven lines. Eventually, I had to read aloud her story as she

copied it, dictating her words and all punctuation. This seemed to help her, as transferring the draft to the final copy was too taxing on Trixie. After five minutes of writing, her hands became tired. She put her pencil down and did a few hand exercises. We talked about whether or not she was holding her pencil too tightly. I explained that her pencil grip should not be tight and showed her how to hold her pencil. She talked about how she does not hold her pencil correctly and how she was not taught how to correctly hold her pencil at her previous school. I continued to dictate as she wrote for a few more minutes, finishing her final draft.

Trixie gave her third composition a title before publishing. I taught her how to use all caps, change the font size, bold, and center her title. To publish her composition, Trixie only had to print her final draft. While the final draft printed, Trixie took a break. Before rating her composition, I asked Trixie, "Did you tell a story? Or do you think it was informational? Did you report information?" She answered, "It was kind of a report." Because Trixie decided that her composition was more informational, that she reported information rather than tell a story, she rated her composition using the expository rubric.

To publish Trixie's fourth composition, I printed it for her. While it was printing, Trixie took a break and read a book.

When asked if there was a difference when publishing with Google Voice Typing and handwritten compositions Trixie stated, "With Google Voice it's faster because when you're writing it, you have to write each word individually and it takes time. And then you have to completely rewrite it and that's no fun. It [Google Voice] is fun and easy."

Attitude survey. Trixie took the Elementary Writing Attitude Survey before using Google Voice Typing and after using Google Voice Typing to give a pre- and posttest measurement score of her attitude towards writing. As she took the survey, Trixie rested her head upon her hand. She read aloud one of the questions, "How do you feel if you don't write as much at school?" Trixie commented, "It's kind of hard to choose because at school it helps you develop writing skills, but I also don't like writing as much. So it's kind of hard to choose." Both Trixie's pre- (35 percentile rank) and post- (22 percentile rank) scores fell below the national norm (50 percentile rank), suggesting a negative attitude towards writing compared to her peers. Yet, when discussing her attitude towards writing after using Google Voice Typing, Trixie stated, "It helps me release my anxiety. It makes me forget about the trouble things in my life. I am not as frustrated when I use Google Voice." When asked about her attitude survey score worsening after using Google Voice Typing, she stated, "Oh, when that said writing, it meant Google Voice or handwriting?" Although Trixie was given instructions to think about Google Voice Typing when taking the posttest, she still thought about composing via handwriting, not Google Voice Typing, when answering the questions on the Elementary Writing Attitude Survey posttest. According to Trixie, even though the Elementary Writing Attitude Survey revealed a different result, her negative attitude towards writing, "kind of went away for a while. It doesn't worsen" when using Google Voice Typing. Therefore, Trixie's posttest score may not be a true indication of how she felt about writing after using Google Voice Typing.

Trixie felt that Google Voice Typing improved her confidence. She shared,

It seems like, using Google Voice gives me more ideas for some reason. It's amazing. It kind of just helps you with like imagination and you don't waste brainpower. Oh, and you don't hurt your muscles really. Except for the fact that you have to hold your microphone up to your mouth.

Therefore, she would recommend using Google Voice Typing to her friends.

Johny

After receiving a flier about my study, Johny's mother contacted me asking for Johny to participate in the study. Johny had poor handwriting skills, and his mother felt learning to use Google Voice Typing would give him an alternative writing tool. He received handwriting instruction at school, using the *Classically Cursive: Bible Primer Book I* handwriting workbook. Throughout the school year, Johnny reviewed Modern Manuscript and was introduced to Modern Cursive. He wrote with his right hand and used a lateral tripod pencil grasp.

Johny believed the most important characteristics of a writer included knowing what to write and writing fantasy, "because there is a lot of fantasy and legends in it." Although Johny "can't see [him]self writing books," he enjoyed writing if "you get to write what you want, but it has to be about a topic" of his choice. He disliked when "you can't write what you want all the time."

When asked what he liked about using Google Voice Typing Johny said, "that you get to speak instead of write and it looks a lot neater." He believed his writing did not change (improve or worsen) since learning the new technology, yet his Google Voice Typing composition "doesn't look like my regular writing. It looks better because it's typed." Johny found Google Voice Typing difficult when "having to find

out what to write." In the future, he felt better about using Google Voice Typing to write than handwriting. As far as recommending Google Voice Typing to friends, he claimed, "I would tell people to try it…because it's easier for me and it might be easier for them."

Johny wrote four compositions under four writing conditions via handwriting and Google Voice Typing, with a narrative guide and without a narrative guide. Johny scored his compositions using a rubric (Appendix C) and ranked (best to worst) each piece of writing based on the 6+1 Traits of Writing (Culham, 2003) (Table 12).

Table 12

Johny's Composition Scores

Title of Composition	*Stormy Days*	*Pompeii*	*The Heroes of Hera*	*The Chicago Fire*
Mode	Handwritten, spontaneous	Handwritten with Narrative Guide	Google Voice Typing, spontaneous	Google Voice Typing with Narrative Guide
Genre	Narrative	Expository	Narrative	Narrative
Rubric	4.5	6.5	5.6	5.4
Ideas	4th	3rd	1st	2nd
Organization	4th	3rd	1st	2nd
Voice	2nd	1st	4th	3rd
Word Choice	4th	3rd	1st	2nd
Sentence Fluency	4th	3rd	1st	2nd
Conventions	4th	3rd	2nd	1st
Presentation	4th	3rd	1st	2nd

Johny's first handwritten composition was a narrative title, *Stormy Days*. He gave the composition a score of 4.5 out of 6. He explained, "I gave myself a 4.5 because my story is my own idea. I can also see my setting in my mind. But my setting is a little fuzzy. So that's why I chose a 4.5." The second handwritten composition, *Pompeii*, Johnny used a narrative guide to plan. Before scoring his composition, he looked at both the narrative rubric and expository rubric and decided he wrote more of an informational text. He scored it a 6.5 out of 6 "because I stuck with my topic, know a lot about that topic, and used information and facts." The third composition, using Google Voice Typing, Johnny scored *The Heroes of Hera* a 5.6 out of 6. He explained, "In my book about heroes, I gave myself a 5.6. My story is half my own idea. I can see my setting in my mind, so that's why I gave myself a 5.6." The fourth composition, using Google Voice Typing and a narrative guide to plan, Johny scored *The Chicago Fire* a 5.4 out of 6. "I come up with cool characters, I can see the setting in my mind, and that's why I gave myself a 5.4."

Johny wrote three narratives and one expository text. He scored his handwritten expository text, *Pompeii*, higher than the other compositions. *Pompeii* was a topic that Johny was interested in and knew a lot about.

Ideas. When looking at what made up the content of each composition, Johny ranked the best to worst ideas in the following order: *The Heroes of Hera*, *The Chicago Fire*, *Pompeii*, and *Stormy Days*. According to Johny, his ideas came "…from some fictional facts and some nonfictional facts." Johny ranked his ideas with Google Voice Typing higher than handwritten compositions. As to why *The Heroes of Hera* was ranked first, Johny stated,

I thought it was the best because it was the biggest one and there's a lot of

details. Also, I came up with the story that Rick Riordan wrote and that I was

reading. But, I didn't read all of it so I just came up with that.

The Chicago Fire was about a boy and his grandpa escaping a fire. Johny used a

narrative guide to plan the story, which had a theme of survival. The idea of *Pompeii*

was based on a book Johny read at school. It was a retelling of the non-fiction book

Pompeii...Buried Alive! Although Johny used a narrative guide to plan *Pompeii* and the

ideas began as a narrative, after writing *Pompeii*, Johny decided it was more of an

informational text. The topic of *Stormy Days*, a narrative, was about a storm that turned

into a tsunami and hurricane that forced natives to leave their island.

Organization. Johny ranked the structure, or organization, of each composition

from best to worst in the following order: *The Heroes of Hera*, *The Chicago Fire*,

Pompeii, and *Stormy Days*. When asked about organizing his compositions, Johny

shared, "I think they all have a beginning, middle, and end." *The Heroes of Hera*, a

narrative, began with an introductory paragraph, several middle paragraphs (some with

dialogue), and a concluding paragraph. *The Chicago Fire*, a narrative, had an

introductory paragraph, four middle paragraphs, and a concluding paragraph. *Pompeii*,

an expository text, organized as a description, had two paragraphs, an introductory

paragraph and middle paragraph, but no concluding paragraph. *Stormy Days*, a

narrative, told in one paragraph, included an introductory sentence, four detailed

sentences, and a conclusion.

Johny ranked the organization of Google Voice Typing compositions higher than handwritten compositions. Google Voice Typing compositions included more paragraphs. Each composition included a title that matched the composition.

Voice. Johny ranked, from best to worst, how well his voice, or spirit, connected to the reader in this order: *Pompeii*, *Stormy Day*, *The Chicago Fire*, and *The Heroes of Hera*. It was Johny's hope that his compositions "…make some people laugh. I like it when people laugh. It puts my spirits up." Johny used punctuation to engage readers. In *Stormy Days*, he used '…' as a way to show anticipation of what was coming up next in the story. In *Pompeii*, he used exclamation points throughout the text to show excitement and danger. For *The Chicago Fire*, Johny wrote captivating sentences like, "They came to the bridge as the flames were licking everywhere." The tone of fear and theme of survival was crafted throughout the story. Johny believed his voice was heard less in *The Heroes of Hera* because it was a retelling of a Rick Riordan story. He stated, "People can't really hear what I am saying."

Johny ranked handwritten compositions higher then Google Voice Typing compositions for voice. Of these two compositions, one was a narrative and one was an expository text. The expository text also received the highest rubric score.

Word choice. Johny ranked his compositions on the best to worst word choice, based upon the use of rich, colorful, precise language, in this order: *The Heroes of Hera*, *The Chicago Fire*, *Pompeii*, and *Stormy Days*. Johny believed his Google Voice Typing compositions were more creative "…because I got to write more words." He thought *The Heroes of Hera* had the best word choice because he "used a lot of very big words" and *Stormy Days* had the worst word choice because, "these aren't the very best

words." *The Heroes of Hera* used exciting words like *slippery*, *piggyback*, *trapped*, *golden*, and *slice*. Vivid and rich words such as *burst*, *frightened*, *licking*, *parading* were used in *The Chicago Fire*. Words found in *Pompeii* included *ordinary*, *peaceful*, and *pouring*, while *Stormy Days* used vibrant verbs like *tore*, *settled*, *crashed*, and *destroyed*. Compositions created with Google Voice Typing included more words than handwritten compositions (Table 13).

Table 13

Total Number of Words, Sentences, and Paragraphs for Johny's Compositions

Title of Composition	Mode	Total # of Words	Total # of Sentences	Total # of Paragraphs
Stormy Days	HWS	62	6	1
Pompeii	HWNG	72	8	2
The Heroes of Hera	GVS	391	32	15
The Chicago Fire	GVNG	213	21	6

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Sentence fluency. When assessing the rhythm and flow of his sentences, Johny ranked his compositions in the following way: *The Heroes of Hera*, *The Chicago Fire*, *Pompeii*, and *Stormy Days*. For Johny, the sentence fluency of each composition created with Google Voice Typing was "better than with handwriting." Johny used a variety of sentences for each composition: *The Heroes of Hera* had thirty-two sentences (simple, compound, complex, compound-complex, and dialogue); *The Chicago Fire* had twenty-one sentences (simple, compound, complex, and compound-complex); *Pompeii* had eight sentences (simple and compound); and *Stormy Days* had

six sentences (simple and compound). The only composition to use dialogue was *The Heroes of Hera*, which helped to show and not just tell the story. For example, Johny wrote, "And the people with wings said, 'Please be above the hotel because we don't want to confuse the people'."

For sentence fluency, Johny ranked compositions using Google Voice Typing higher than handwritten compositions. The compositions that were dictated using Google Voice Typing had more sentences and used more of a variety of sentences compared to Johny's handwritten compositions.

Conventions. Johny ranked his compositions based on the best to worst use of standard writing conventions (e.g., spelling, punctuation, and capitalization) in the following order: *The Chicago Fire*, *The Heroes of Hera*, *Pompeii*, and *Stormy Days*. Google Voice Typing compositions were ranked higher than handwritten compositions. Johny states, "I think Google Voice is better because you have to say it instead of write it and it never has any spelling errors." Johny made one spelling mistake in his handwritten composition, *The Heroes of Hera*. He made punctuation errors in all of the compositions and capitalization errors in all compositions but *The Chicago Fire*. Overall, Johny made more total errors in spelling and punctuation for handwriting, and an equal amount of total errors in capitalization in handwriting and Google Voice Typing (Table 14).

Table 14

Errors in Conventions for Johny's Compositions

	Mode	Capitalization	Punctuation	Spelling
Stormy Days	HWS	7	4	0
Pompeii	HWNG	1	3	1
The Heroes of Hera	GVS	8	2	0
The Chicago Fire	GVNG	0	1	0

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Presentation. Johny ranked his compositions by best to worst presentation, how pleasing the final piece was to the eye, in this order: *The Heroes of Hera* (Figure 9), *The Chicago Fire* (Figure 10), *Pompeii* (Figure 11), and *Stormy Days* (Figure 12). He stated,

> The handwriting sometimes have illustrations, Google Voice Typing doesn't.
> The handwritten ones don't look as good [or] as neat. This one [*The Heroes of Hera*] looks like it would be a very long story and that you would like it. That one [*Stormy Days*] doesn't look very neat so you can barely read it.

Each story had a title located at the beginning; *Stormy Days'* title was written on the same sheet of paper as the composition; the title for *Pompeii* was written on the front of the booklet; and the titles for *The Heroes of Hera* and *The Chicago Fire* had larger fonts on separate pages from the compositions. For the handwritten compositions, Johny wrote them on constructions paper. There were no lines for him to write on, so on the first one he drew his own lines and on the second one he used a ruler to draw lines. His handwriting was adequate, but could be neater in letter formation. Johny started his

first story with all caps, for example, "ONE day…". He wrote from the left side of the page to the right, but for *Pompeii*, he did not choose an appropriate break of the word 'survived' when coming to the end of the line. He wrote survive- and put the 'd' on a new line. Johny chose Arial, 48 point font, for the title and Arial, 11 point font, for the body of *The Heroes of Hera*. He chose Arial 72 point font for the title and 11 point font for the body of *The Chicago* Fire. Both compositions had visual appeal, with very few spacing errors throughout. In the end, Google Voice Typing compositions scored higher on presentation then handwritten composition.

The Heroes of Hera

Jason saw someone in a dream that he had to rescue. Jason saw the queen of the gods trapped in a cage. Jason said to Leo, "if you find me a ride you can be in the quest." At that night they were sitting around the campfire and then he thought, "if I find a ride I can go on the quest.

Then Leo found Festus trapped in a cage filled with tobacco sauce. And then Festus led Leo to Bunker 9 where Leo gave Festus wings.

The next day Jason looked up and there he saw Leo and Festus. When Piper came she look bullied because her cabin mates were bullying her. Jason said, "you found a ride" to Leo. "So you can go on a quest with us."

They were riding Festus when Leo fell asleep and Jason started to drive Festus. Then they came to a hotel where they met two people in wings and their wings were purple. And the people with wings said, "Please be above the hotel because we don't want to confuse the people."

And Jason said, "I am the son of Zeus."

The people in wings asked, "what's your name?"

Jason said, "Jason."

The people in wings asked, "THE Jason?"

"We need to find Hera," Jason said.

They said," come to our dad and he will show you." They went into the hotel and they came into an icy room.

Leo folded Festus into a suitcase. They tried climbing up the icy stairs but it was too slippery so they asked the winged people to give them piggyback rides to the top of the stairs. They came to a door and they opened it . Inside it was 0 Fahrenheit. There was icicles hanging from the ceiling That grew 10 feet long and in the farthest wing of the room they saw the north wind god.

The god said, "why have you come here ?"

Jason said ,"we are looking for Hera."

The north wind god said ,"she is right this way."

The north wind god led them to a door and there Hera was trapped in a cage. Jason felt the key in his pocket and he unlocked the cage and Hera came out. Then Jason used his golden double bladed sword to slice open the ropes. There Hera went back to the clouds.

Figure 9. The Heroes of Hera – Johny's first Google Voice Typing composition

The Chicago Fire

It was a peaceful day in Chicago . Joey was walking down the sidewalk when a building burst into flames. Joey was very frightened.

Joey was scared as he ran down the street, all around him was in flames. He ran all over town looking for a place to hide. He found somewhere inside his house and ran to his grandpa.

They ran to the river. They came to the bridge as the flames were licking everywhere. Joey and his grandpa jumped into the river. They came to a boat. It was in the reeds. Just as they were about to get on it burst into flames.

They kept swimming until they came to the far side of the river. Just as they were about to get on flames came parading towards them. They were surrounded in flames.

They went back to the bridge and it was already in flames. They went under it and they came to a different river. Then they found out once they got out of the river that it was the river that went to Chicago!

When they got back to Chicago, everywhere was on fire and nobody was to be found. Everybody was on boats out to sea. They found the last boat and went out to sea.

the end

Figure 10. The Chicago Fire – Johny's second Google Voice Typing composition

It was a sunny and very ordinary day in Pompeii. Mount Vesuvius looked as peaceful as ever. One day the top of Mount Vesuvius got blown right off!! Lava came pouring out! The volcano was not finished yet! a cloud of pumice hurried Pompeii

Pliny saw the whole thing and he survived it but that didn't stop him from writing a story. So... he wrote a story about the cloud of pumice.
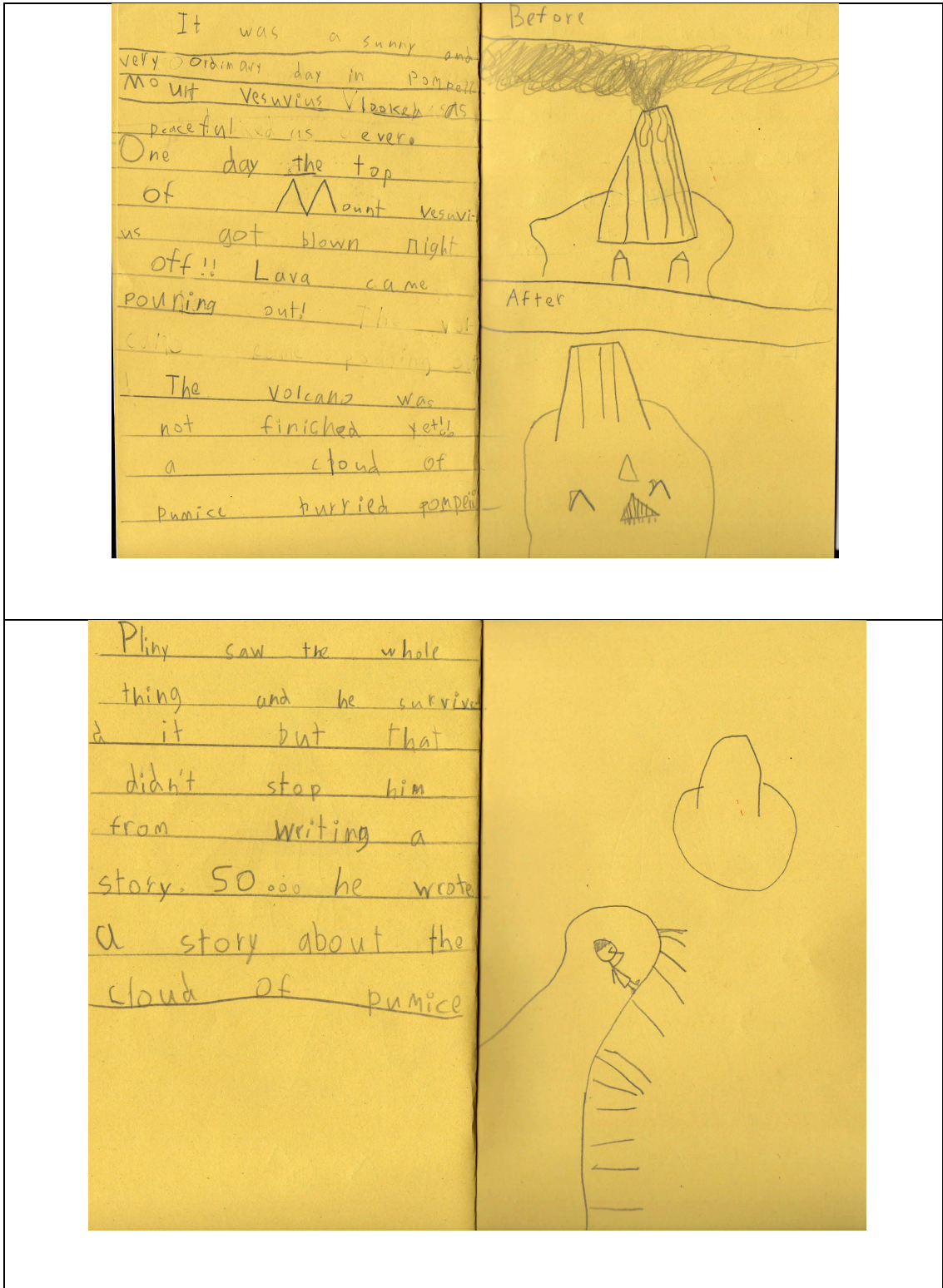
Figure 11. Pompeii – Johny's second handwritten composition

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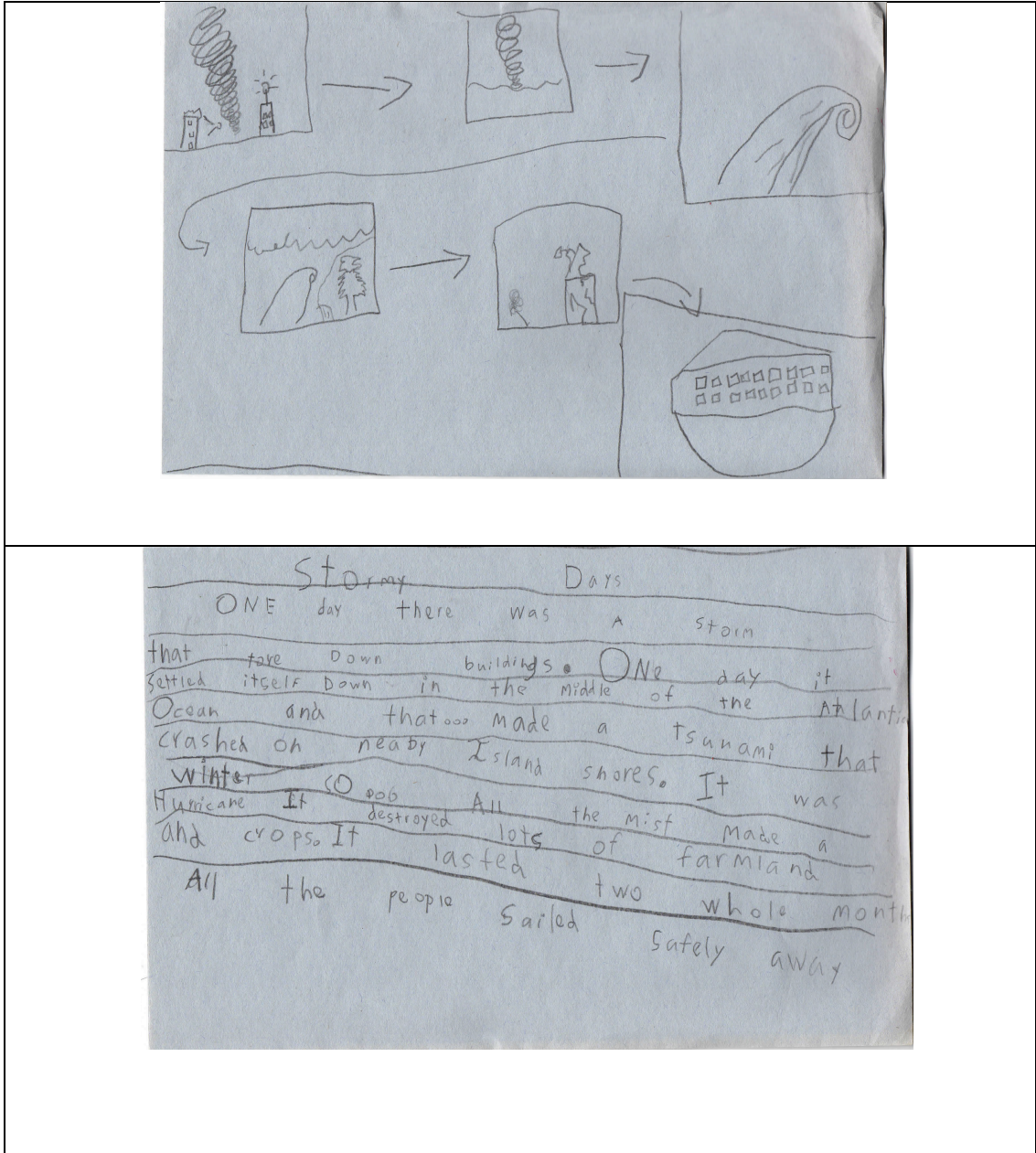
Figure 12. Storm Days – Johny's first handwritten composition

In summary, Johny wrote three narratives and one expository text. He scored *Pompeii*, a handwritten expository text, with the highest rubric score. Johny gave the highest rankings to Google Voice Typing over handwriting for ideas, organization, word choice, sentence fluency, conventions, and presentation. Handwriting ranked

highest in voice. Overall, Google Voice Typing compositions received better writing trait scores than handwritten compositions.

Prewriting. For his first handwritten composition, Johny chose to use a green pen and notebook paper to write on. He was instructed to compose a spontaneous writing and had about fifteen minutes to plan and draft. I stated to Johny, "Think about what you want to write about and write during that time. At the end of that fifteen minutes, if you're not done, I'll give you more time." Before he started, I went back over the meaning of prewriting and drafting, and left a writing process checklist next to Johny. He was advised not to worry about spelling and grammar, but to concentrate on getting his thoughts down. He sat at a student desk, with a green pen in his right hand and his left hand at his forehead. After a few seconds, he wrote a title and immediately began to write without doing any planning.

Johnny used the narrative guide to plan his second writing. As the narrative guide was explained to Johny, he asked, "Am I going to write a new story?" He was told to plan out a new story first, using the narrative guide, before writing. I guided him through parts of the guide as he orally answered and wrote his answers, but he also did parts of it individually. When he didn't understand a part, he asked for clarification. Sometimes he laid his head on his arm on the desk as he wrote, and other times he bent his elbow and rested his forehead on his hand. His attitude was normal, not excited but not unwilling either. He took about eight minutes to plan.

Johny's third composition was a spontaneous writing using Google Voice Typing. From the time he opened a new document to writing the draft took about sixteen minutes. Johny struggled with coming up with ideas, so I guided him with

questions, starting with the characters and setting. He dictated the characters name and the setting in an outline (Table 15). The first time Johny started dictating, he said, 'Boy Jason,' but Google Voice Typing wrote 'Boy JasonComma'. This happened twice. Johny tried correcting it using the 'select' command both times, but it did not work, so he used the delete button. The third time Johny tried dictating the symbol for comma (,), Google Voice Typing correctly placed a comma in the text.

Table 15

Johny's Google Voice Typing Outline-Composition #3

Boy Jason, Piper, Leo.   Setting Festus

The fourth composition was a planned writing using a narrative guide. Johny gave his story a title, *The Chicago Fire*. The plot had a beginning (peaceful), middle (scared), and end (still scared). He chose a conflict between a character (Joey) and nature. The setting was a fire that occurred during the night in Chicago. Johny planned to write in first person, but in the end the story was told in third person.

When discussing his prewriting strategies, Johny shared that, "I'm more creative when I'm handwriting but it's easier to write in Google Voice." Johny used a narrative guide to plan the second and fourth compositions. For the other two, he did not do any planning for the first composition but went straight into drafting; and for the third composition he made an outline.

Drafting. As Johny drafted his first spontaneous handwritten composition, he bent his elbow and rested his forehead on his left hand. He used his elbow to hold his notebook paper as he wrote with his right hand. He wrote continuously. He kept his

head down looking at the paper the entire time. He didn't ask questions, but used the time to write. He stayed focused and concentrated the whole time. At different points he put his left hand down and used it to hold the paper in place. He wrote for about five and a half minutes.

As Johny wrote his second handwritten draft, at times he laid his head on the desk. Other times he rested his head on his arm or palm of hand. At one point, his knee was bent with his foot in the chair, resting his chin on his knee as he wrote. He wrote continuously for about seven and a half minutes, and then Johny started drawing an illustration. Johny was asked if he would like to draw the illustration during publishing, so he decided to wait to illustrate.

When drafting the third spontaneous composition, Johny orally composed with Google Voice Typing. He continued to struggle after making his outline, so he was asked to write one sentence, then, to write another sentence and continue to add to it. After about one minute, he wrote the second sentence. He did great after he got started. I encouraged him not to rewrite the story he was currently reading but to write his own version. As Google Voice Typing made mistakes, Johny was reminded that he could correct those later and to just get his thoughts recorded. He dictated continuously, turning the microphone off when he needed to think. A few times, he deleted a word or group of words by typing or using the 'select' command. Although Johny was in a quiet classroom, using an external microphone, he spoke very quietly and a warning came up on the computer screen, "We're having trouble hearing you. If you are experiencing issues, try moving to a quieter place or using an external microphone." I

reminded him to speak loudly enough for Google Voice Typing to hear him. Johny

drafted for about twenty-one minutes.

Johny drafted his fourth composition using Google Voice Typing. He did not

have trouble getting started like his third composition because he had a narrative guide.

Previously Google Voice Typing had a hard time hearing his voice, so he was reminded

to speak loudly enough for it to hear him. Google Voice Typing made errors in his first

sentence and he immediately edited. He used both typing and his voice to correct the

mistakes. After making the first correction, he continued to dictate without worrying

about mistakes and making corrections for several sentences. At times, he forgot to say

the punctuation. He turned the microphone off while thinking and turned it back on

when he was ready to dictate. The warning came up again and again, and towards the

end Google Voice Typing misrecognized more words than not. Johny drafted for about

fourteen minutes.

For Johny drafting a composition was "easier on Google Voice than on

handwriting. It's easier to write because you only have to say it instead of write it."

Johny spent more time drafting his Google Voice Typing compositions than his

handwritten compositions. Yet, his Google Voice Typing compositions had more

words per minute than his handwritten compositions (Table 16).

Table 16

Total Drafting Times for Johny's Compositions

Title	Mode	Drafting Time (in minutes)	Total # of Words on Draft	Words per Minute
Stormy Days	HWS	5.5	43	8
Pompeii	HWNG	7.5	53	7
The Heroes of Hera	GVS	21	391	19
The Chicago Fire	GVNG	14	215	15

Note. Total # of Words on Draft / Drafting Time = Words per minute (Rounded to nearest whole number); *Note.* Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Revising/Editing. To begin the revision of the first composition, I read Johny's story out loud as he made changes, sentence by sentence. He made changes in red. I guided him through the process, asking questions, giving suggestions, and encouraging him. When editing, Johny was shown how to utilize the margins on the notebook paper and move each line over to the left margin. Next, he corrected capitalization and spelling errors. Johny spent about fourteen minutes revising and editing.

Before revising his second handwritten composition, Johny gave a big yawn. He used a green pen to make corrections. Johny noticed unneeded words and crossed them out. Using the narrative guide, I pointed out parts that he left out, so Johny went back and added to his composition. He rested his chin on his knee that was up in his chair. After writing for a few minutes, he added illustrations. I read aloud what he added and Johny decided to include a few more details. During editing, I read aloud his

story as he made corrections in capitalization, punctuation, and spelling. He used the *Pompeii…Buried Alive* book to check his spelling.

For the third spontaneous composition using Google Voice Typing, Johny began at the beginning of the document. As he came to something that needed correction, he fixed it by typing and never used the microphone again. To move around the document, he used the arrow buttons as well as the mouse. He made corrections in capitalization, indentions, and misrecognitions. I guided him to know where he needed paragraph breaks. He put in commas and quotation marks for the dialogue. Johny was shown how to add a title, center it, and change the font size. He typed the title of his story, deciding to put it on its on page. Johny revised and edited for about forty minutes.

On his fourth composition using Google Voice Typing, Johny did not turn back on his microphone but used typing. He made corrections in capitalization, punctuation, and paragraph breaks. Because Johny forgot to say the punctuation for a few sentences during dictation, he had several run-on sentences. After he made all the corrections, he added a title on a new page. He typed the title and changed the font. Johny revised and edited for about twenty minutes.

Revising and editing occurred separately when handwriting, but simultaneously for Google Voice Typing. When revising handwritten compositions, Johny shared that he would "x out a lot of things or wrote over them" and with Google Voice Typing "I had to push all the arrows a bunch of times and I pushed the return button. I could delete things and write over again." When editing the handwritten compositions he stated, "you can delete things and you have to erase them or write over them."

Publishing.   For the first spontaneous handwritten composition, Johny decided to publish on construction paper using a pencil. He did not want me to draw lines to write on, but he did that for himself. At times, he rested his forehead on the palm of his left hand, other times he laid his head down one his arm on the desk or he sat up to write. Johny placed his final copy on his right side and draft on his left as he copied. He stayed on task, was not distracted, and had a good attitude. As he published, he told me he was changing some words. He did not take a break, but spent the entire time concentrating on publishing, his pencil moving the entire time. Johny wrote the entire story in about ten minutes and then drew an illustration. After five minutes of drawing, Johny announced he was finished with his story. He put his name on the story, read it out loud, and folded the paper in half.

On the second handwritten composition, Johny chose to publish his story in a booklet, using construction paper. On the front cover, he used a green pen and put the title, author, and illustrator. He wrote on pages two and four, and illustrated on pages three and five. He used a pencil to write the story and illustrate. Lines were drawn on the pages for him to write on. He used his time wisely, staying on task, with good concentration, participating the entire time. The draft was on his left side as he wrote the final draft on his right side. When he finished after fifteen minutes of writing, he read aloud his final draft. He noticed he got off when copying, so he erased that part. At the end, I asked him if he thought he wrote a narrative or informational text. He decided the composition was more of an informational text than a narrative.

To publish the handwritten compositions, Johny stated, "I had to make sure I wrote what the corrections said on the other papers, the revised papers." On his second

handwritten composition, he got off on his copying. Johny's Google Voice Typing compositions were published, "on the same piece of paper" as the drafts, so he did not have to rewrite the entire composition. All he had to do was print it. Therefore, publishing the handwritten compositions took longer than printing the Google Voice Typing compositions.

Attitude Survey. Johny took the Elementary Writing Attitude Survey before using Google Voice Typing and after using Google Voice Typing to give a pre- and posttest measurement score of his attitude towards writing. Both Johny's pre- (22 percentile rank) and post- (24 percentile rank) scores fell below the national norm (50 percentile rank). A score below the national norm suggested a negative attitude towards writing compared to his peers. Johny shared that he felt "a lot better [using Google Voice Typing] than just plain handwriting." Additionally, his attitude worsened towards writing "when not doing Google Voice Typing." He described his confidence in writing after using Google Voice Typing as "the same as it was before."

Sam

Sam's mother contacted me after receiving the flier from his teacher. Sam's teacher believed Google Voice Typing could give Sam an alternative writing tool. Sam was a reluctant writer, meaning he could write, but did not have the motivation to write. He also had poor writing and handwriting skills. Handwriting was challenging for Sam because at times it was physically painful. He no longer received handwriting instruction as a fourth grader. Sam used his left hand to write with a lateral tripod grasp.

To Sam, the characteristics of good writers included thinking of "what they're writing and the way they write it." As far as seeing himself as a writer, he stated, "not that much. I kind of write, I write stuff down but I don't see myself as like a big writer." When asked what he enjoys about writing, Sam admitted, "I enjoy being able to put my thoughts on something so other people can read, [but] I dislike having to write too much down in a short period of time. If you write too much your hand hurts."

Sam liked using Google Voice Typing for several reasons. He explained,

I like being able to write stuff down but not having to use my hands and stuff because sometimes I can think of it and say it much quicker than I can write it down. It was easy to get words down if you say them correctly. So, if you practice enough you can do even better with it.

He found Google Voice Typing difficult when "it doesn't get the words you say right and there's some things it can't do and you have to do that manually."

Sam described his writing after using Google Voice Typing,

I think the stories that I used Google Voice Typing for are better than the ones I didn't because they look nicer. It's easier to punctuate stuff…[T]he handwriting takes long, takes a while to think and to write it down, but the Google Voice Typing once you've thought it…you're just having to say it. It's much quicker than the writing it down.

When asked how it helped his writing, Sam stated,

…it helped it look neater, helped everything get punctuated better, and spelled better...I didn't have to worry about the spelling. I just had to worry about if it would hear the right word. So as long as I said it correctly, there wasn't any

problem…It's not like I had to worry about spelling with the computer writing it down. So, it was much easier because of that; therefore, it was better.

Sam did not feel like Google Voice typing worsened his writing. "I don't really think it did that much. There wasn't really any problem."

Sam wrote four compositions under four writing conditions via handwriting and Google Voice Typing, with a narrative guide and without a narrative guide. Sam scored his compositions using a rubric (Appendix C) and ranked (best to worst) each piece of writing based on the 6+1 Traits of Writing (Culham, 2003) (Table 17).

Table 17

Sam's Composition Scores

Title of Composition	*The Lost Dog*	*The Cop and the Robbers*	*Bob and Joe Go to the Carnival*	*The Snake and the Mice*
Mode	Handwritten, spontaneous	Handwritten with Narrative Guide	Google Voice Typing, spontaneous	Google Voice Typing with Narrative Guide
Genre	Narrative	Narrative	Narrative	Narrative
Rubric	5	5	5	5
Ideas	4th	1st	3rd	2nd
Organization	1st	2nd	3rd	4th
Voice	4th	1st	3rd	2nd
Word Choice	3rd	1st	4th	2nd
Sentence Fluency	3rd	1st	4th	2nd
Conventions	4th	3rd	2nd	1st
Presentation	4th	3rd	2nd	1st

Sam's first handwritten composition was a narrative titled, *The Lost Dog*. He gave the composition a score of 5 out of 6. He explained,

> I gave myself a 5 because I had a solid thought with conflict that is resolved and I had several characters. There is a setting I can see in my mind in each event. Each event moves logically towards the story but at the same time it was not a predictable plot with a conflict that doesn't really have a resolution. I had multiple characters that were fresh. I would prefer to put an in between but there wasn't, so I just put a 5.

For the second handwritten composition, Sam used a narrative guide to plan. He scored *The Cop and the Robbers* a 5 out of 6. Sam's reasoning for this score, "It's the same as the last one. I would have given an in between because I did have a story and multiple characters, but there wasn't an in between so I just went with 5." Sam used Google Voice Typing to compose his third narrative, *Bob and Joe Go to the Carnival*. His reasoning for giving it a score of 5 out of 6,

> Same again. I would have given an in between but there wasn't. I had a solid plot and multiple fresh characters. There's a setting and each event moves the story forward logically so I put a 5 instead of a 6 or a 4.

His last narrative using Google Voice Typing and a narrative guide to plan, Sam scored *The Snake and the Mice* another 5 out of 6. He explained, "Again, in between...so 5 because I had a story with a solid plot, several characters, mice and the snake. There's a setting, the desert, a sunny day, and moved the story logically. So, I gave myself a 5." Sam scored all of his compositions a 5 out of 6, regardless of writing mode (handwritten

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or Google Voice Typing) or whether it was a spontaneous writing or planned using a narrative guide.

Ideas. When looking at what made up the content of each composition, Sam ranked the best to worst ideas in the following order: *The Cop and the Robbers*, *The Snake and the Mice*, *Bob and Joe Go to the Carnival*, and *The Lost Dog*. Sam ranked compositions planned with a narrative guide higher than spontaneous writings. Sam explained,

> The reason I put *The Log Dog* at the worst is because there are so many stories about dogs getting lost and stuff, so it's not the most original plot. Then, the reason I didn't put *Bob and Joe Go to the Carnival* worst is because it had a story line that wasn't super commonly used but the character names…aren't the most original. Then *The Snake and the Mice* because well, just like *Bob and Joe*, there aren't that many things there, but there wasn't multiple things happening. It was just mainly them looking for food. And then *Cop and Robber* because there are many things that happened and the location and stuff is very in depth compared to the others. Like that's [*The Snake and the Mice*] just a sunny day in the desert. That's [*Bob and Joe Go to the Carnival*] some random day at a carnival. And that's [*The Lost Dog*] just somewhere in some city…This [*The Cop and the Robbers*] gives you like a big description of the place, what's going on and why stuff is happening and it has multiple parts of the story. Like there's the robbery, then there's the chase…when the robbers go in the house, and when the cop finds them and catches them."

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Organization.   Sam ranked the structure, or organization, of each composition from best to worst in the following order: *The Lost Dog*, *The Cop and the Robbers*, *Bob and Joe Go to the Carnival*, and *The Snake and the Mice*. *The Lost Dog* was organized in a beginning paragraph and ending paragraph. Sam explained,

> *The Lost Dog* because it's a shorter story, it gives you main plot parts: the dog
>
> gets lost, he tries to find his way home but he can't, he gets to some tunnel that
>
> leads to a river where a fish is, and the fish tells him where the owner is, he goes
>
> to where the owner is, which is on the north side of the river. Then, the dog
>
> goes up to his owner and then they all go home. So, it's pretty straightforward.

The Cop and the Robbers included an introductory paragraph, a middle paragraph, and a concluding paragraph. Sam described the organization,

> *The Cop*, there's more parts to it but the cop is in London on a rainy day and he
>
> was chasing some robbers that robbed a bank. So, he chased them to a house
>
> and the robbers went in and so the cop had to go inside and arrest them. So, he
>
> went in and arrested them and brought them to jail.

Bob and Joe Go to the Carnival included an introductory paragraph, middle paragraph, and a concluding paragraph. Sam shared this thought, "*The Carnival*, well when I first wrote it, it was more kind of weirdly put but then [I] fixed it." *The Snake and the Mice* included and introductory paragraph, six middle paragraphs (mostly dialogue), and a concluding paragraph. Sam ranked it last place

> …mainly because there's just a lot of looking for food and stuff. The snake is
>
> hungry. He looked for food. He found some mice. Then they looked for food.
>
> They found some food but there wasn't enough. The mice took the food. The

snake looked for more food. The snake found more food and they got more

food.

Each composition included a title that matched the composition. Overall, Sam ranked

handwritten compositions higher than Google Voice Typing on organization. Although,

Google Voice Typing, with a narrative guide, had more paragraphs (eight) compared to

the other compositions.

Voice. Sam ranked, from best to worst, how well his voice, or spirit, connected

to the reader: *The Cop and the Robbers*, *The Snake and the Mice*, *Bob and Joe Go to*

the Carnival, and *The Lost Dog*. Sam explained,

Law enforcement is kind of a thing I like. My whole life I've wanted to be a

cop, I've wanted to be a paramedic, I've wanted to be a firefighter, I've wanted

to be in the army. Serving people is a thing I've commonly have wanted to do.

So, it just seems like something I'd write about.

Sam ranked *The Snake and the Mice* second because, "I like weird locations, like things

that a lot of stories are actually not in." The setting of *The Snake and the Mice* took

place in the desert with a theme of survival and conflict between characters. He ranked

Bob and Joe Go to the Carnival third "because sometimes I write short, straight out

stories that aren't very long and not very hard to read." The theme of friendship in *Bob*

and Joe Go to the Carnival was weaved throughout the story as characters figured out

how to escape a stopped Ferris wheel. Sam placed *The Lost Dog* "least because I don't

really write much about animals when I do write." In this narrative, Sam used a talking

fish to help a lost dog find his way back home to his family.

Sam wrote about what he was interested in, service (*The Cops and Robbers*) and weird locations (*The Snake and the Mice*). He scored compositions that he connected to higher than the other compositions. Compositions planned with a narrative guide received higher rankings than spontaneous compositions.

Word choice. Sam ranked his compositions on the best to worst word choice, based upon the use of rich, colorful, precise language, in this order: *The Cop and the Robbers*, *The Snake and the Mice*, *The Lost Dog*, *Bob and Joe Go to the Carnival*. Sam explained,

> Well the cop one is mainly [first] because it is kind of more in depth than the rest of them. So, there's bigger words and more of them. Then, *The Snake and the Mice* because there are bigger words, more of them, and it's just like there's a larger variety of words just like the cop one. *The Lost Dog* is my third because well it's kind of straightforward and there are not that many big words. It's not as in depth as *The Snake and the Mice* or *The Cop and the Robbers*, and it's a little bit shorter. Then, *Bob and Joe*, it's the shortest. It's least in depth of any of them and there are not that many big words. There's *Ferris wheel*, *roller coaster*, and those are some of the biggest words there are.

In *The Cop and the Robbers*, Sam used interesting words like, *chasing*, *sneak*, and *arrest*; and in *The Snake and the Mice* he included exciting words such as *puddle*, *spotted*, *argued*, and *slithered*. Words found in *The Lost Dog* were *tunnel*, *barking*, and *hopped*.

Although Sam ranked compositions planned with a narrative guide higher than spontaneous compositions for word choice, Google Voice Typing compositions had

more words than handwritten compositions (Table 18). Additionally, Sam thought *Bob and Joe Go to the Carnival* was the shortest story, which it appeared to be when visually looking at it, but was actually the second longest story.

Table 18

Total Number of Words, Sentences, and Paragraphs for Sam's Compositions

Title	Mode	Total # of Words	Total # of Sentences	Total # of Paragraphs
The Lost Dog	HWS	90	8	2
The Cop and the Robbers	HWNG	83	9	3
Bob and Joe Go to the Carnival	GVS	148	12	3
The Snake and the Mice	GVNG	263	18	8

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Sentence fluency. When assessing the rhythm and flow of his sentences, Sam ranked his compositions in the following way: *The Cop and the Robbers*, *The Snake and the Mice*, *The Lost Dog*, and *Bob and Joe Go to the Carnival*. According to Sam, "*The Cop and the Robbers* had kind of long sentences but not very many short and choppy ones, but they sound right. They're put in a nice way." *The Cops and the Robber* had nine sentences (simple and compound). Sam ranked *The Snake and the Mice* second, "[be]cause it's kind of like *The Cop and the Robbers*, just to me a tad bit worse. But still not too long of sentences, but some are kind of long and not very many are short and choppy." *The Snake and the Mice* included eighteen sentences (simple, compound, complex, compound-complex, and dialogue). *The Lost Dog* had eight sentences (simple, compound, and dialogue). Sam ranked it third because "there are not

very many long sentences. It's a little bit more short and choppy and not thought out as well." *Bob and Joe Go to the Carnival* had twelve sentences (simple, compound, and complex). "*Bob and Joe Go to the Carnival* [is last place] because it has a lot of short sentences, no long ones really, a lot of short ones it seems like and not very much in between."

Sam ranked compositions planned with a narrative guide higher than spontaneous compositions for sentence fluency. Compositions created with Google Voice Typing had more sentences and a better variety of sentences than handwritten compositions.

Conventions. Sam ranked his compositions based on the best to worst use of standard writing conventions (e.g., spelling, punctuation, and capitalization) in the following order: *The Snake and the Mice*, *Bob and Joe Go to the Carnival*, *The Cop and the Robbers*, and *The Lost Dog*. Sam explained,

> *The Snake and the Mice* is the best with all of the punctuation, well-spelled words. And then *Bob and Joe Go to the Carnival* is the second. The ones done with the computer's help are done the best with spelling and punctuation. Then *The Cop and the Robbers* and *The Lost Dog*. Mainly the handwritten ones were the last ones because sometimes I forget to punctuate and sometimes I do bad with spelling stuff correctly.

Sam ranked Google Voice Typing compositions higher than handwritten compositions for conventions. The only two spelling errors occurred in *The Cop and the Robbers*, a handwritten composition. All of the compositions had punctuation and

capitalization errors. Google Voice Typing had the most punctuation errors, while

handwriting had the most capitalization errors (Table 19).

Table 19

Errors in Conventions for Sam's Compositions

	Mode	Capitalization	Punctuation	Spelling
The Lost Dog	HWS	5	6	0
The Cop and the Robbers	HWNG	2	4	2
Bob and Joe Go to the Carnival	GVS	1	4	0
The Snake and the Mice	GVNG	1	10	0

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Presentations. Sam ranked his compositions by best to worst presentation, how

pleasing the final piece was to the eye, in this order: *The Snake and the Mice* (Figure

13), *Bob and Joe Go to the Carnival* (Figure 14), *The Cop and the Robbers* (Figure 15),

and *The Lost Dog* (Figure 16). Sam explained,

> Well, *Bob and Joe* and *The Snake and the Mice* are the top two because they
>
> were done on the computer and it's much easier to make things look nice when
>
> the computer is kind of writing it down for you. Like when you are typing you
>
> can't like accidentally make a line or something that's kind of long, like a longer
>
> L than you meant to have…You can accidentally tap the wrong key or
>
> something but then you just press the back button and it deletes it. Then you
>
> press the right one. So those two look much nicer because of that. And *The*
>
> *Cop and the Robber* because to me it looks a little bit nice than *The Lost Dogs*."

Sam scored his Google Voice Typing compositions higher in presentation than his handwritten compositions. All of Sam's compositions included a title at the beginning. The handwritten compositions were written with notebook paper and pencil. Sam's handwriting was adequate, but could be neater in letter formation and spacing. He utilized the left margin, but not the right margin, as he wrote to the edge of the paper. For Google Voice Typing, Sam chose Arial 30 point font in all caps for the title of *The Snake and the Mice* and Arial 11 point font for the body. He chose Arial 24 point font for the title of *Bob and Joe Go to the Carnival* and Arial 11 point for the body. Both of the Google Voice Typing compositions were visually appealing, with minor spacing issues.

THE SNAKE AND THE MICE

There was a snake in the desert and he was hungry, so he went looking for food. There wasn't many places to hide in the desert so the snake would see anything out there. He looked under a rock but there was nothing there. He looked near a puddle of water but there was nothing there either. Then he looked in a small hole in the sand.

There were mice inside of the hole. The mice came out and said, "Hi snake."

The Snake said, "Hi, do you have any food?"

The mice said, "No."

So the snake and the mice both went looking for food but they couldn't find any. They just kept on looking until finally one of the mice spotted some food but there was only enough for one of them. They argued about who should get that food.

The mice said, "We should get the food because there's more of us and we found the food."

But the snake said, "I should get the food because I am the one who's been looking the longest."

Then the mice took the food before the snake could stop them. So the snake slithered away and found more food, enough for both the mice and him. He went to find the mice and the snake found them inside the hole that the snake found them in last time. He told the mice about the big amount of food he found, so the mice went to where he said the food was to see if he was telling the truth, and he was.

THE END

Figure 13. The Snake and the Mice – Sam's second Google Voice Typing composition

Bob and Joe Go to the Carnival

Bob went by Joe's house to pick Joe up. Bob and Joe went to the fair. First, they went to the ferris wheel. Then Bob and Joe went to the roller coaster . The roller coaster stopped while Bob and Joe were on it.

Bob and Joe had to get off of the roller coaster somehow. So they had to move the metal bar that was holding them in. They pushed and they pushed until they finally broke free. Then they ran down the steps that were there just in case the ride broke down.

Next, they went to every other ride they could before the fair closed down for the night.

Then they left because the fair was about to close down so they went to Joe's house and watched movies until late at night. Bob got tired so he went to his house and went to bed.

Figure 14. Bob and Joe Go to the Carnival – Sam's first Google Voice Typing composition
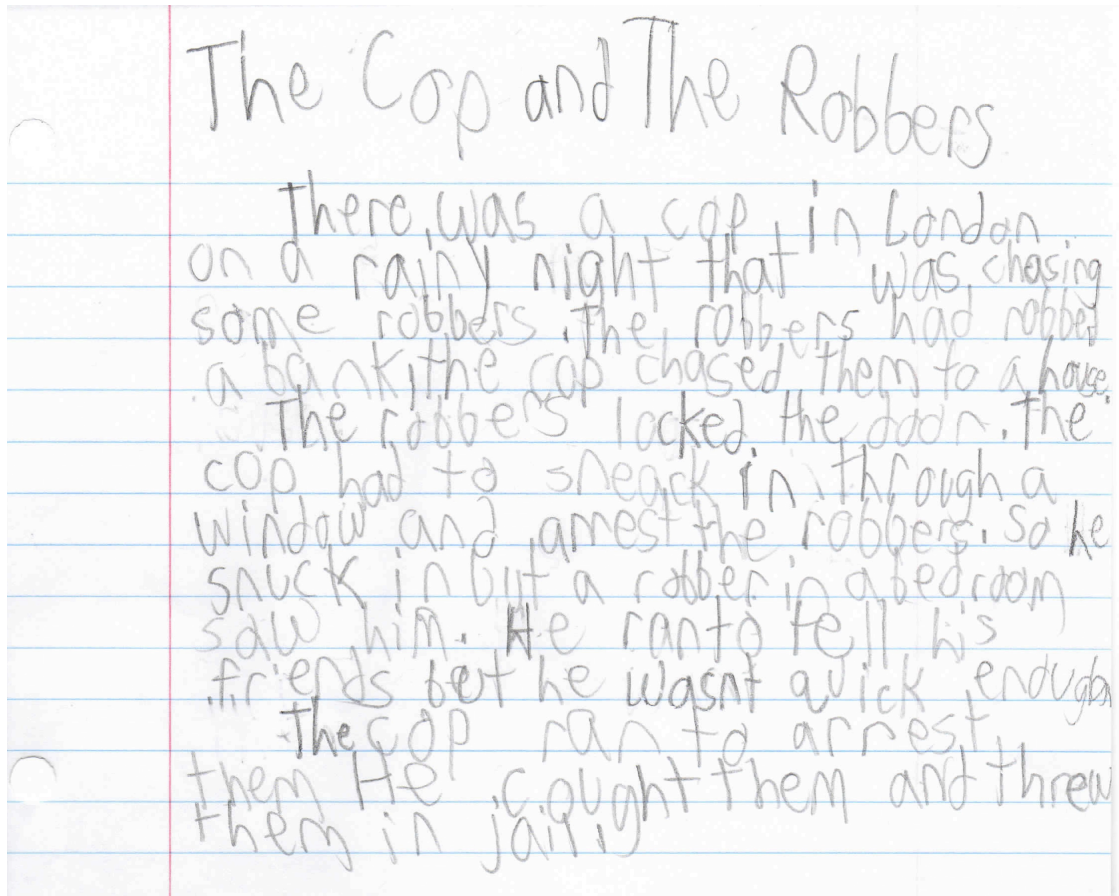
Figure 15. The Cop and the Robbers – Sam's second handwritten composition
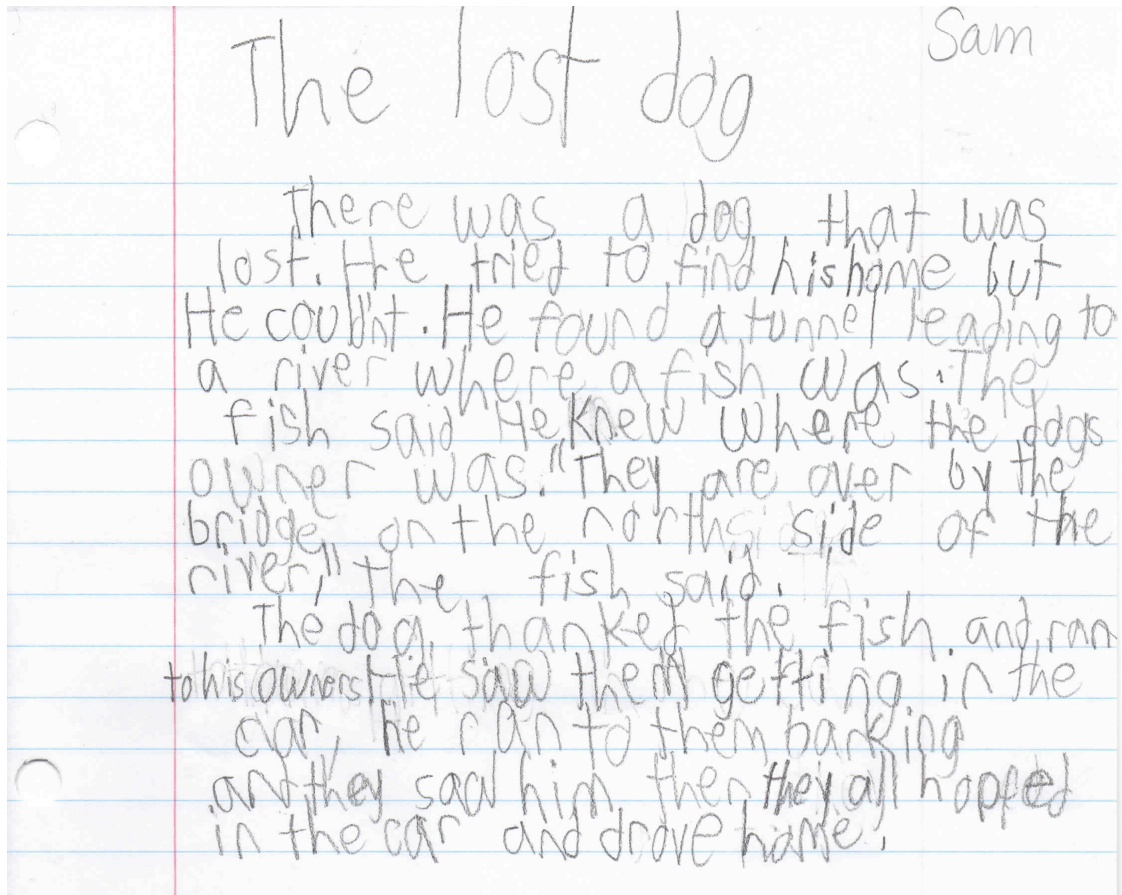
Figure 16. The Lost Dog – Sam's first handwritten composition

In conclusion, Sam gave all of his narratives a score of five out of six. He ranked handwriting higher than Google Voice Typing for ideas, organization, voice, word choice, and sentence fluency. Google Voice Typing ranked the highest for conventions and presentation.

Prewriting. After giving Sam the assignment for his first handwritten spontaneous writing, he asked a clarifying question, "So, do I think of my own start?" I responded, "Yea, you're just thinking of your own story. Whatever idea you come up with, you can just write." Sam took time to think up ideas, sitting for about one and a half minutes before picking up his pencil. He yawned a few times. Sam wrote with a

pencil and notebook paper. He sat in a comfortable chair at a table. When asked about planning his composition, he shared,

> I was thinking about my pet dog at the time, so I was like 'Hey, I will write a story about a dog'. So that's the main way I thought about *The Lost Dog* story. I wrote down the smallest parts, like a narrative guide, except I didn't really get one.

On the second handwritten composition, Sam planned with a narrative guide. I explained the guide and how he would use it to plan his story. He asked, "So, do I write what I'm thinking on this?" I told him "yes" and guided him through each part of the narrative guide, asking him questions as we went. Sam seemed eager to participate. When filling out the guide, Sam wrote with his left hand and bent his right arm, resting his head on his hand. He wrote his answers as I asked questions. He gave himself time to think before finalizing each part. In Sam's words, "I used the narrative guide to kind of write down the main parts like the conflict, basic plot parts, the location, weather, time, time period, and the point of view…if I had dialogue and stuff like that." He waited to give his story a title after he wrote it. Sam spent about seven minutes planning his story.

The third composition was a spontaneous writing using Google Voice Typing. Sam struggled to get started, so we orally talked through the parts of the narrative guide although he did not actually fill one out. Nine minutes in and he still had not come up with an idea. Sam was advised to start with the setting and characters, so he dictated a short outline of the setting and characters (Table 20). He used his own set of

headphones with a built in microphone. From the time he started his outline to drafting

was about three and a half minutes.

Table 20

Sam's Google Voice Typing Outline-Composition #3

 New York Boy Bob Joe Fair

Sam used a narrative guide to plan his fourth composition. Sam used a pencil to

fill in the narrative guide. Sam described the process, "I used the narrative guide for

The Mice and Snake one, where I wrote down the plot and topic and point of view and

the place and time, weather, time period, and if I have dialogue and monologue…" He

chose a setting in the afternoon with a location in the desert. There was a conflict

between characters (snake and mice) and food. He decided to tell the story in third

person and used dialogue.

When asked if there was a difference when planning handwritten compositions

compared to Google Voice Typing, Sam replied, "No, not really." The main difference

in planning strategies occurred when Sam planned with a narrative guide verses no

guide. When Sam didn't have a guide, he thought for a few minutes before writing or

he developed an outline.

Drafting. Sam started drafting his first handwritten spontaneous writing after

about four minutes. He yawned a few times and bent his right elbow, resting his

forehead on his hand as he wrote. He didn't write continuously but stopped while

thinking. He looked around the classroom. He wasn't frustrated or off task, but fiddled

with his pencil while thinking. He wrote the most about thirteen minutes after

beginning. His ideas did not come quickly, but once they came, Sam wrote continuously. It took about fifteen minutes to draft his composition.

After completing the narrative guide, Sam immediately started writing his second composition. He had his right arm bent, resting his forehead on his hand. At times he looked up and stopped writing as he thought. About six minutes into his draft, Sam made adjustments to his narrative guide and then continued to write. Sam fidgeted some, but worked the entire time. He spent about fifteen minutes drafting.

For the third spontaneous writing, Sam dictated his story using Google Voice Typing. As he started dictating, he realized he had to turn off the microphone when asking me questions; otherwise, Google Voice Typing recorded my words. At first, Sam did not dictate continuously but stopped to think. For example, he dictated a sentence with punctuation, stopped, turned off the microphone, waited several minutes, turned the microphone back on, and dictated again. When dictating, Sam used commands such as 'new line' and he dictated the punctuation. As Sam dictated, he revised when he noticed misrecognitions. At times, he used the delete button to erase mistakes and then he typed the correct word; and other times he deleted the wrong word and used Google Voice Typing to speak the correct word. Towards the end, he dictated more than one sentence at a time. Once a warning came up on the computer screen stating, 'We're having trouble hearing you. If you are experiencing issues, try moving to a quieter place or using an external microphone.' Sam continued drafting for a total of about seventeen minutes.

As Sam started dictating his fourth draft with Google Voice Typing, he left out the punctuation, but dictated as if he were speaking. Sam turned off the microphone

when he was thinking. A message popped up saying, "Sorry, didn't hear that. Check microphone." At one point, Sam didn't dictate for about three minutes. He made a few edits while drafting. For example, he dictated a sentence and it made several errors so he started correcting the mistakes by typing. Sam took about fourteen minutes to dictate his story.

Sam's drafting time for each composition hovered around fifteen minutes, the longest and shortest draft times were with Google Voice Typing (Table 21). He drafted about the same amount of words per minute on the first three compositions, but drafted about three times as many on the fourth composition using Google Voice Typing. When drafting by handwriting, Sam used paper and pencil, and when drafting with Google Voice Typing, Sam dictated with his voice.

Table 21

Total Drafting Times for Sam's Compositions

Composition	Mode	Drafting Time (in minutes)	Total # of Words on Draft	Words per Minute
The Lost Dog	HWS	15	85	6
The Cop and the Robbers	HWNG	15	71	5
Bob and Joe Go to the Carnival	GVS	17	126	7
The Snake and the Mice	GVNG	14	295	21

Note. Total # of Words on Draft / Drafting Time = Words per minute (Rounded to nearest whole number); Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Revising/Editing. Sam shared his experience of the revision process for his handwritten composition, stating,

> …you'd write down what you wanted or you'd like. If you didn't have an eraser to erase something, you'd like have to cross it out then…write it down. Or squeeze a small word in a tight space in between other words or erase some words to make a sentence smaller to sacrifice for the word that you 100% need.

Sam also shared how he revised and edited when using Google Voice Typing.

> Well I'd look at a sentence and I'd try to think of how I could make it better, kind of sometimes longer, sometimes just better thought out words, better spelled words, better punctuation…You are saying it and you can speak much quicker than you can think and write. So sometimes you don't really need the revising as much for the computer than you do with this [handwriting]…With this [Google Voice Typing] you just kind of say the whole thing in a shorter period of time, so you don't need the revising as much…with the computer you just say 'select' the word 'delete' then say the new word that you wanted or you can type it.

When revising Sam's first handwritten composition, I used guiding questions to see if he wanted to add to his composition. Sam chose to add a sentence of dialogue, and he divided the story into two paragraphs. He gave the story a title after revising. During editing, I read aloud each sentence and Sam made corrections in capitalization, punctuation, and spelling with a green pen. He commented on how he made uppercase letters when they should have been lowercase. Sam had a great attitude and was open to making corrections. He spent about ten minutes revising and editing.

Sam spent about twenty-seven minutes revising and editing his second handwritten narrative. I asked guiding questions to help him see where he could clarify parts that readers might have questions. Sam added sentences on the back of his draft. He gave his story a title, inserted paragraph breaks, and checked for beginning, middle, and end. During editing, I read aloud his story and he made corrections in capitalization and punctuation, using a green pen.

For the third composition, using Google Voice Typing, Sam began revising by adding more details and sentences to his story. He used both his voice and typing. Sam turned off the microphone when making additions with typing. As he revised, I asked questions to clarify meaning and to let him know if the reader would have questions. When he finished the revisions, Sam added a title, centered it, and chose a bigger font. During editing, Sam made all corrections by typing. He corrected errors in capitalization, punctuation, and paragraphing. Sam spent about fifteen minutes revising and editing.

When revising and editing his fourth composition, using Google Voice Typing, Sam spent about twenty-three minutes. He made all corrections by typing. He corrected errors in capitalization and punctuation, and added in quotation marks for dialogue. Sam also corrected paragraphing. At the end of revising and editing, Sam added a title.

Sam used a green pen to revise and edit his handwritten compositions and his voice or typing for his Google Voice Typing compositions. Revising and editing occurred on the rough draft of each composition. Sam added a title to all of his compositions during this phase of the writing process.

Publishing. When it comes to publishing his compositions, Sam shared,

Well, the publishing says to make it neat and make it look nice. With the handwriting it's much harder because you have to practice to get good handwriting. But on the computer you don't really have to practice to make it look nice. You can just say it and it makes it look nice on its own. If you want to go to another line, you just say 'new line'. It's not like you have to practice to make your words look nicer. So with the neat part, computers are much easier for doing that. It won't look sloppy like you do sometimes with writing.

When asked what he had to do to publish handwritten pieces, Sam replied, "I had to rewrite the whole thing over again" and Google Voice Typing pieces, "well you just select new file and save the story again, which takes like half the time of writing this [handwritten] two times. Instead of saying the story two times, it takes about half the time than writing it two times."

For his first handwritten narrative, Sam chose to use notebook paper and pencil to publish. He rewrote the draft for thirteen minutes. As he wrote with his left hand, he bent his right elbow and rested his forehead on his hand; other times his cheek rested on his hand. The draft was to the left of his final draft, his arm in-between the two papers as he wrote. Sam was very quiet and focused. If he made a mistake, he erased and moved onward. About ten minutes in, Sam took a small break, resting his hand from writing. After he was finished, he read his story out loud. He made a few corrections as he read aloud.

Sam used a pencil and notebook paper to publish his second handwritten composition. He took about one minute before he started writing again. He kept his

final draft on his left side and the draft on the right as he copied it. He wrote continuously, remembering to insert the new parts. After two minutes, he started shaking his hand and took a break to let his hand rest. He took a walk, going to the restroom and getting a drink of water. After a break, he sat back down and got straight to work. As he copied, he made corrections as he went. Most times, his right arm was bent with his hand on his forehead. After about ten minutes, he said he was finished. He read the story out loud. He pointed out that his left hand was red and tired from all the writing.

To publish his Google Voice Typing compositions, Sam printed each one. It only took Sam a few seconds to publish the Google Voice Typing compositions, while it took ten to thirteen minutes to publish handwritten compositions. Additionally, Google Voice Typing compositions were ready for publishing at the end of revising and editing. It did not require the extra step of rewriting the entire draft, with corrections, as with handwriting.

Attitude Survey. Sam took the Elementary Writing Attitude Survey before using Google Voice Typing and after using Google Voice Typing to give a pre- and posttest measurement score of his attitude towards writing. Both of Sam's pre- (78 percentile rank) and post- (95 percentile rank) scores fell above the national norm (50 percentile rank). A score above the national norm indicated a positive attitude towards writing compared to his peers. Sam shared that his attitude improved towards writing after using Google Voice Typing. He stated, "I like writing more now and I am much more confident at writing. The voice typing, for me at least, is easier than writing it down."

Chapter 5: Discussion and Conclusions

In this chapter a cross-case analysis is presented based on the themes that emerged during data collection. The chapter is arranged into three sections: a summary of the study, a summary of the findings in relation to the three research questions, a discussion, implications for practice, and recommendations.

Summary of the Study

This multiple-case study explored how elementary students used Google Voice Typing to compose. More specifically, this study examined how students responded to using voice-to-text as a method of composing, the effect voice-to-text had on features of compositions, and changes that occurred in the composing process for students when using voice-to-text. Understanding how participants responded to this experience could be beneficial to other reluctant writers, or students who struggle with writing or handwriting skills. Data were gathered from semi-structured participant interviews, observations, and documents.

Summary of Findings

Research Question 1. How did students respond to using voice-to-text as a method of composing?

Peniqua and Trixie were reluctant writers, Johny had poor handwriting skills, and Sam was a reluctant writer with poor writing and handwriting skills. None of the participants saw themselves as writers, but Peniqua and Johny enjoyed writing when they could write about a topic of their choice. Trixie liked the creative aspect of writing, and Sam enjoyed putting his thoughts down for others to read. Trixie, Johny,

and Sam believed good writers think and know what to write, and Peniqua thought good writers thoroughly tell a story.

Participant views & attitudes. All of the participants expressed positive views about Google Voice Typing because it allowed them to avoid handwriting (MacArthur & Cavalier, 2004). Peniqua, Trixie, and Sam, in particular, expressed dislike for handwriting. Trixie, Johny, and Sam indicated they would recommend Google Voice Typing to a friend. Although Peniqua said she would not recommend Google Voice Typing to a friend, she would tell friends about it so they would not have to handwrite. Participants shared the following reasons for liking Google Voice Typing:

- Think and said words quicker than handwriting words

- Helped with not forgetting what to say

- Made writing easier

- Produced better compositions.

Much like Gardner (1980) discovered when dictating to a tape recorder, when composing with Google Voice Typing, thinking unfolded naturally at the speed of speech, with little interruptions. Participants thought and said the words quicker because the transcription mode (Google Voice Typing) was less demanding and interfered less on their working memory than handwriting. Participants focused more on high-level composing concerns instead of low-level transcription concerns (De La Paz, 1999; MacArthur & Cavalier, 2004; MacArthur et al., 2016; Quinlan, 2004).

Gardner (1980) proposed that dictation captured fleeting thoughts before ideas were lost. Google Voice Typing assisted in this area as well. Dictation provided closer

synchrony between thoughts and composed words. Thinking unfolded naturally, allowing thoughts to be dictated as they came to the participant.

Google Voice Typing made composing an easier task. Participants concentrated on content generation, and worried less about spelling or handwriting. They did not concern themselves with spelling words correctly because Google Voice Typing did that for them. Focus moved away from forming letters correctly, spacing letters correctly, and neat handwriting, to generating content.

Only Johny felt that his writing did not improve (or worsen) when using Google Voice Typing. Peniqua, Trixie, and Sam thought their Google Voice Typing compositions were better than the handwritten compositions. All participants believed their handwritten compositions looked different from their Google Voice Typing compositions. To them, the Google Voice Typing compositions looked "nicer" than handwritten compositions.

Although participants liked Google Voice Typing, they had reasons for not liking Google Voice Typing as well. A few reasons for not liking Google Voice Typing included:

- Difficulty editing
- Dictating the punctuation
- Misrecognitions.

Both Peniqua and Trixie thought it was hard to edit with Google Voice Typing, much like the participants in MacArthur & Cavalier's (2004) study. Editing via dictation required too much effort and was too difficult, because the participants had very limited training and experience on how to edit with voice commands. Therefore,

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participants used typing to correct edits. With typing, participants moved the cursor where they needed to make an edit, which was much easier than using voice commands.

Dictating punctuation was a new skill. Participants had to remember to say the punctuation while dictating. Google Voice Typing did not automatically insert the punctuation. Both Trixie and Sam waited to insert punctuation after drafting the composition. They typed in the punctuation during editing.

Identifying misrecognitions was a new skill as well. At times, when dictating with Google Voice Typing, participants said a word, but Google Voice Typing misrecognized the word and typed the wrong word on the screen. Participants learned to watch for these mistakes and corrected misrecognitions while drafting or revising.

Peniqua, Trixie, and Johny all had slightly negative attitudes towards writing before using and after using Google Voice Typing (Table 22). As De La Paz (1999) suggested, the mechanics of writing affected their view of writing and their motivation. After using Google Voice Typing, Peniqua's attitude improved a little, Trixie's worsened, and Johny's was about the same. On the other hand, Sam had a positive attitude towards writing before Google Voice Typing and his attitude improved even more after using Google Voice Typing.

Table 22

Writing Attitude Scores Before and After Using Google Voice Typing

	Peniqua	Trixie	Johny	Sam
Before Google Voice Typing	12	35	22	78
After Google Voice Typing	30	22	24	95

Note. The numbers in the chart represent percentile ranks. The national norm (50th percentile rank) indicates neither a positive or negative attitude towards writing (0 = very negative, 100 = very positive).

Research Question 2. What effect, if any, did voice-to-text have on the content, appearance, or other features of compositions?

Rubric scores. After participants finished a composition, they assessed their compositions using a rubric (Appendix C). They rated their compositions on a scale of 1 – 6 (worst to best) (Table 23) for how well they told a story (narrative) or how well they reported information (expository). Peniqua rated her narrative compositions higher than her expository texts. She also rated compositions planned with a narrative guide higher than spontaneous writings. A handwritten composition received the highest rating. Trixie rated her compositions planned with a narrative guide higher than spontaneous compositions. She gave the highest rating to her Google Voice Typing narrative planned with a narrative guide. Johny gave his handwritten expository text, planned with a narrative guide, the highest rating. Sam rated all of his compositions, regardless if created with Google Voice Typing or handwritten, narrative guide or no narrative guide, the same rating.

Using a narrative guide to plan compositions influenced how participants, other than Sam, rated their compositions. Peniqua, Trixie, and Johny gave the highest rating, 6, 6, and 6.5, respectively, to a composition that was planned with a narrative guide. In previous research, advanced planning was found to benefit writers (Quinlan, 2004), just like the participants in this study.

Rubric scores were averaged (Table 23). The Mean (*M)* rubric scores for handwritten/spontaneous, handwritten with narrative guide, Google Voice Typing/spontaneous, and Google Voice Typing with narrative guide were 4.5, 5.6, 5.0, and 5.5, respectively. Compositions planned with a narrative guide averaged higher

rubric scores than spontaneous compositions. Handwritten compositions using a

narrative guide to plan had the highest Mean ($M = 5.6$).

Table 23

Rubric Scores and Mean Rubric Scores by Writing Mode

Mode	Participant	Genre	Rubric Score	Mean Rubric Scores (*M*)
HWS	Peniqua	Expository	4.5	
	Trixie	Narrative	4	
	Johny	Narrative	4.5	*M* = 4.5
	Sam	Narrative	5	
HWNG	Peniqua	Narrative	6	
	Trixie	Narrative	5	
	Johny	Expository	6.5	*M* = 5.6
	Sam	Narrative	5	
GVS	Peniqua	Expository	5	
	Trixie	Expository	4.5	
	Johny	Narrative	5.6	*M* = 5.0
	Sam	Narrative	5	
GVNG	Peniqua	Narrative	5.5	
	Trixie	Narrative	6	
	Johny	Narrative	5.4	*M* = 5.5
	Sam	Narrative	5	

Note. Handwritten, Spontaneous = HWS; Handwritten/Narrative Guide = HWNG; Google Voice Typing, Spontaneous = GVS; Google Voice Typing/Narrative Guide = GVNG; Mean Rubric Scores (*M)* = Rubric Score/4

Participants ranked (best to worst) their four compositions based on the 6+1 Traits of Writing: ideas, organization, voice, word choice, sentence fluency, conventions, and presentation (Culham, 2003) (Table 24). The writing traits for ideas, organization, word choice, sentence fluency, conventions, and presentation were ranked higher for Google Voice Typing than handwriting. Google Voice (GV = 21) received more rankings than handwriting (HW = 9). Google Voice Typing influenced how participants ranked their compositions on the basis of the 6+1 Traits of Writing.

Table 24

Participants' Best Traits of Writing

Traits	Peniqua	Trixie	Johny	Sam	GV Total	HW Total
Ideas	GVS	GVNG	GVS	HWNG	3	1
Organization	HWNG, GVS	GVNG	GVS	HWS	3*	2*
Voice	GVS	GVS	HWNG	HWNG	2	2
Word Choice	GVS	GVNG	GVS	HWNG	3	1
Sentence Fluency	HWNG, GVS	GVS	GVS	HWNG	3*	2*
Conventions	HWNG	GVS	GVNG	GVNG	3	1
Presentation	GVS	GVNG	GVS	GVNG	4	0
TOTALS					21	9

Note. Handwritten, Spontaneous = HWS; Handwritten/Narrative Guide = HWNG; Google Voice Typing, Spontaneous = GVS; Google Voice Typing/Narrative Guide = GVNG; Google Voice = GV; Handwriting = HW; *Peniqua gave a tie between GV and HW

Ideas. For having the best idea, Peniqua, Trixie, and Johny ranked a Google Voice Typing composition the highest (Table 24). Peniqua and Johny's compositions

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were spontaneous writings, while Trixie's composition was planned with a narrative guide. Sam ranked his handwritten narrative, using a narrative guide, best on the basis of ideas. Trixie, Johny, and Sam wrote narratives and Peniqua wrote an expository text. Google Voice Typing influenced how Peniqua, Trixie, and Johny viewed how their ideas came through the compositions, but not Sam. The use of a narrative guide influenced how Sam viewed his voice in his writings.

> *Organization.* When ranking their compositions according to the best in organization, Peniqua had a tie between her handwritten composition with a narrative guide and her spontaneous writing using Google Voice Typing; Trixie and Johny ranked Google Voice Typing highest; and Sam ranked his handwritten spontaneous writing the highest (Table 24). All compositions were narratives, but Peniqua had a tie between a narrative and expository text.

The number of sentences and paragraphs varied between handwritten and Google Voice Typing compositions (Table 25). Peniqua had the highest number of sentences (8) with a handwritten composition, and the same number of paragraphs (1) for all four compositions. Trixie had the highest number of sentences (16) with Google Voice Typing, but the highest number of paragraphs (5) with handwriting. Johny and Sam had the highest number of sentences (32 and 18, respectively) and paragraphs (15 and 8, respectively) with Google Voice Typing. Spontaneous compositions using Google Voice Typing had more sentences (66) and more paragraphs (23) compared to the other writing conditions. Overall, participants had more sentences (118) and more paragraphs (40) with Google Voice Typing compared to handwriting. Regardless of

using Google Voice Typing or handwriting, participants were able to organize their

compositions into sentences and paragraphs with a beginning, middle, and end.

Table 25

Total Number of Sentences and Paragraphs for Final Drafts

	Mode	Peniqua	Trixie	Johny	Sam	Totals per condition	Totals for HW & GV
# of Sentences	HWS	5	7	6	8	26	59
	HWNG	8	8	8	9	33	
	GVS	6	16	32	12	66	118
	GVNG	3	10	21	18	52	
# of Paragraphs	HWS	1	5	1	2	9	18
	HWNG	1	3	2	3	9	
	GVS	1	4	15	3	23	40
	GVNG	1	2	6	8	17	

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG;
Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide =
GVNG; Handwriting = HW; Google Voice Typing = GV

Voice. Peniqua and Trixie both ranked their spontaneous Google Voice Typing

compositions with having the best voice (Table 24). Johny and Sam ranked their

handwritten compositions using a narrative guide to plan with the best voice. Peniqua,

Trixie, and Johny's compositions were expository texts, and Sam's composition was a

narrative. The participants' voice or personality came through their writings whether

they dictated with Google Voice Typing or handwrote their compositions. Peniqua

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liked to use creative and made-up words, Trixie wanted to show her humorous side, as did Johnny, and Sam wrote about what interested him.

Word choice. Peniqua, Trixie, and Johny ranked Google Voice Typing highest in word choice compared to handwriting, and Sam ranked handwriting higher (Table 24). Peniqua and Johny's compositions were spontaneous writings, and Trixie and Sam used a narrative guide to plan their stories. Peniqua wrote an expository text and the other participants wrote narratives.

Sentence fluency. Trixie and Johny ranked their spontaneous Google Voice Typing compositions highest for sentence fluency (Table 24). Sam ranked his handwritten composition using a narrative guide as the highest, and Peniqua had a tie between handwritten with narrative guide and spontaneous with Google Voice Typing. Johny and Sam's compositions were narratives, Trixie's was expository, and Peniqua had both a narrative and expository text. In addition, Peniqua, Trixie, and Johny's compositions that were ranked highest for sentence fluency also contained the most sentences; and the compositions that Trixie, Johny, and Sam created with Google Voice Typing contained more sentences than their handwritten compositions (Table 25). Except for Trixie, at least one Google Voice Typing composition for each participant contained all four types of sentences (simple, compound, complex, and compound-complex) (Table 26). Peniqua and Sam used dialogue in one handwritten composition and one Google Voice Typing composition; Trixie used dialogue in one handwritten composition; and Johnny used dialogue in one Google Voice Typing composition.

Table 26

Sentence Variety for Each Composition

Participant	HWS	HWNG	GVS	GVNG
Peniqua	simple, compound, and complex	simple, compound, complex, and dialogue	simple, compound, complex, and compound-complex	simple and dialogue
Trixie	simple, compound, and dialogue	mostly simple, complex	mostly simple, compound	simple, compound, and complex
Johny	simple and compound	simple and compound	simple, compound, complex, compound-complex, and dialogue	simple, compound, complex, and compound-complex
Sam	simple, compound, and dialogue	simple and compound	simple, compound, and complex	simple, compound, complex, compound-complex, and dialogue

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG

Conventions. When ranking their compositions in terms of conventions, Trixie,

Johny, and Sam gave Google Voice Typing the highest ranking (Table 24). Peniqua

ranked her handwritten composition using a narrative guide best in conventions.

Peniqua, Johny, and Sam's compositions were narratives, but Trixie's was an

expository text. All of the participants made capitalization errors in handwriting (Table

27). Only Peniqua did not make capitalization errors with Google Voice Typing. The

highest amount of capitalization errors occurred in handwriting for Peniqua and Sam,

Google Voice Typing for Johny, and a tie for Trixie. Learning to say the punctuation

was a new skill for these participants, and as a result Trixie, Johny, and Sam had

punctuation errors in Google Voice Typing. They also had punctuation errors in

handwriting. The highest amount of errors in punctuation occurred in Google Voice for

Trixie and Sam, but handwriting for Johny. Peniqua did not have any punctuation

errors in any of her compositions. Although Google Voice Typing did not make

spelling errors, errors occurred if a participant typed a word incorrectly when making

revisions or edits. Both of Trixie's Google Voice Typing compositions had spelling

errors, but the other participants did not have spelling errors with Google Voice Typing.

Trixie, Johny, and Sam had spelling errors in their handwritten compositions as well.

The highest amount of spelling errors occurred in handwriting for Trixie, Johny, and

Sam.

The total errors in terms of conventions for handwritten/spontaneous,

handwritten with a narrative guide, Google Voice Typing/spontaneous, and Google

Voice Typing with a narrative guide were 29, 21, 20, 16, respectively. Handwritten

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compositions had more errors in conventions compared to Google Voice Typing

compositions, which were 50 and 36, respectively.

Table 27

Total Number of Errors for Conventions

		HWS	HWNG	HW totals	GVS	GVNG	GV totals
	Peniqua	0	2	2	0	0	0
	Trixie	1	2	3	2	0	2
Capitalization	Johny	7	1	8	8	0	8
	Sam	5	2	7	1	1	2
	TOTALS	13	7	20	11	1	12
	Peniqua	0	0	0	0	0	0
	Trixie	1	1	2	1	2	3
Punctuation	Johny	4	3	7	2	1	3
	Sam	6	4	10	4	10	14
	TOTALS	11	8	19	7	13	20
	Peniqua	0	0	0	0	0	0
	Trixie	5	3	8	2	2	4
Spelling	Johny	0	1	1	0	0	0
	Sam	0	2	2	0	0	0
	TOTALS	5	6	11	2	2	4
Total per Condition		29	21	50	20	16	36

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG; Handwriting = HW; Google Voice Typing = GV

Presentation. All of the participants ranked Google Voice Typing 1st (Table 24) or 2nd for best presentation. Trixie, Johny, and Sam gave the highest score to narratives and Peniqua's highest score was an expository text. Google Voice Typing looked completely different than handwritten compositions, mainly because they were typed and printed. All participants believed Google Voice Typing compositions looked neater than handwritten compositions (Quinlan, 2004). Johny was the only participant to add illustrations to his handwritten compositions.

Research Question 3. How did voice-to-text change the composing process for students?

Participants wrote four compositions under four writing conditions via handwriting and Google Voice Typing, with a narrative guide and without a narrative guide. The first and third compositions were spontaneous writings, and the second and fourth compositions were planned using a narrative guide. The first and second compositions were handwritten, whereas the third and fourth compositions used Google Voice Typing to compose.

Prewriting. Two changes occurred during the prewriting process of this study. The first change occurred in how participants planned their first and third spontaneous handwritten compositions. For the first handwritten spontaneous writing, the participants spent very little time or no time at all planning but went straight into drafting. However, Trixie, Johny, and Sam created an outline (Gardner, 1980; Wetzel, 1996) for the third composition, a spontaneous writing using Google Voice Typing. Participants went from little to no planning on the first composition

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(handwriting/spontaneous) to creating an outline on the third composition (Google Voice Typing/spontaneous).

The second change occurred between how much time was spent on planning spontaneous compositions verses planned compositions using a narrative guide. When planning spontaneous compositions, participants did not plan at all or very little (composition one and three). Participants used a narrative guide to plan their second and fourth compositions. Time spent planning with a narrative guide was much longer than with spontaneous compositions. The narrative guide allowed participants to spend an abundant amount of time planning the plot, conflict, setting, theme, point of view, and characters. Worth noting, participants used handwriting when filling out the narrative guide. Additionally, similar to Quinlan's (2004) findings, compositions planned with a narrative guide were rated higher than spontaneous writings for Peniqua and Trixie (Table 23). Johny rated handwritten planned with a narrative guide the highest rubric score. Although Sam ranked all of his compositions the same, he spent more time planning when using a narrative guide and it made planning easier.

Drafting. The drafting process changed in four ways between handwriting and Google Voice Typing. Changes that occurred during drafting included: 1) transcription mode, 2) drafting times, 3) total number of words in rough drafts, and 4) number of words per minute in rough drafts.

The first change occurred in the transcription mode. With handwriting, participants composed with their hands, and with Google Voice Typing, they composed with their voice and at times by typing. When drafting the handwritten compositions, Peniqua, Trixie, Johny, and Sam used notebook paper and pencils, and Peniqua used a

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purple pen as well. Peniqua and Trixie used a lateral quadruped pencil grasp and Johny and Sam used a lateral tripod pencil grasp, which resulted in their hands feeling fatigued and painful at times. Drafting with Google Voice Typing was much different. The participants spoke into a microphone and Google Voice Typing dictated the compositions onto a computer screen. Orally composing a composition came with a new set of skills. Participants had to remember to turn off the microphone when not speaking to avoid unwanted words showing up on their compositions. Participants also learned to speak with a consistent volume and speed, and if not, they received a warning because the microphone could not hear their voice. At times participants forgot to dictate the punctuation while speaking and had to add it during editing. All the participants struggled with revising and editing while drafting and wanted to correct mistakes as they appeared on the computer screen, instead of concentrating on getting their thoughts dictated.

The second change in the drafting process occurred in the time used to draft a composition. Unlike MacArthur & Cavalier (2004), composing times differed from handwriting to Google Voice Typing (Table 28). With Google Voice Typing, Peniqua dictated quicker than when handwriting. Trixie and Sam's longest and shortest drafting times occurred with Google Voice Typing. Johny drafted longer with Google Voice Typing compared to handwriting. The average drafting times (in minutes) for handwritten/spontaneous, handwritten with a narrative guide, Google Voice Typing/spontaneous, and Google Voice Typing with a narrative guide were 10, 13, 15, and 10 respectively. On average, handwritten/spontaneous and Google Voice Typing with a narrative guide had the shortest drafting times.

The third change in the drafting process occurred in the total number of words in rough drafts (Table 28). Trixie, Johny, and Sam's Google Voice Typing rough drafts had more words than their handwritten rough drafts. Peniqua's handwritten composition planned with a narrative guide had the most words in the rough draft. The average numbers of words on rough drafts for handwritten/spontaneous, handwritten with a narrative guide, Google Voice Typing/spontaneous, and Google Voice Typing with a narrative guide were 63, 68, 175, and 185, respectively. On average, Google Voice Typing rough drafts had more words compared to handwritten rough drafts.

The fourth change in the drafting process occurred in the number of words per minute (Table 28). Peniqua, Johny, and Sam had more words per minute with Google Voice Typing compared to handwritten compositions. Peniqua's Google Voice Typing composition planned with a narrative guide had the most words per minute (51) and had the shortest drafting time (1.5 minutes). Trixie's Google Voice Typing composition planned with a narrative guide had the shortest drafting time (10 minutes) and produced the most words per minute (15). Johny's longest drafting time (21 minutes) produced the most words per minute (19), which occurred with a spontaneous Google Voice Typing composition. Sam's Google Voice Typing composition planned with a narrative guide had the shortest drafting time (14 minutes) and produced the most words per minute (21). The average numbers of words per minute for handwritten/spontaneous, handwritten with a narrative guide, Google Voice Typing/spontaneous, and Google Voice Typing with a narrative guide were 7, 6, 13, and 26, respectively. On average, Google Voice Typing compositions had more words per minute compared to handwritten compositions.

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Table 28

Mean Drafting Times, Mean Words on Drafts, and Mean Words per Minute

		HWS	HWNG	HW Totals	GVS	GVNG	GV Totals
Drafting Time (in minutes)	Peniqua	9	18	27	2.5	1.5	4
	Trixie	11	11.5	22.5	19	10	29
	Johny	5.5	7.5	13	21	14	35
	Sam	15	15	30	17	14	31
	TOTALS	40.5	52	92.5	59.5	39.5	99
Mean Drafting Times (rounded to nearest minute)		10	13	23	15	10	25
Total # of Words on Rough Drafts	Peniqua	38	82	120	50	76	126
	Trixie	85	64	149	134	153	287
	Johny	43	53	96	391	215	606
	Sam	85	71	156	126	295	421
	TOTALS	251	270	521	701	739	1440
Mean # of Words on Drafts (rounded to nearest whole)		63	68	130	175	185	360
Words per Minute	Peniqua	4	5	9	20	51	71
	Trixie	8	6	14	7	15	22
	Johny	8	7	15	19	15	34
	Sam	6	5	11	7	21	28
	TOTALS	26	23	49	53	102	155
Mean Words per Minute (rounded to nearest whole)		7	6	12	13	26	39

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG; Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide = GVNG; Mean Drafting Time = Total Drafting Time/4; Mean # of Words on Drafts = Total # of Words on Drafts/4; Mean Words per Minute = Total Words per minute/4

Revising. The goal of revision was to make improvements to the compositions, by clarifying and refining ideas. Revising changed in two ways when comparing handwriting to Google Voice Typing. The first change occurred in how the participants revised and the second change happened with the appearance of the revisions.

Participants made revisions on the rough drafts, but how they revised differed from handwriting to Google Voice Typing. As participants revised their handwritten compositions, additions of words or sentences were handwritten in the blank spaces, unwanted words or sentences were crossed out, arrows revealed where to move words or sentences, and substitutions were made with a colored pen. Participants used their voice or typing when improving their Google Voice Typing rough drafts. To add or substitute words or sentences, they placed the cursor where they wanted it and voiced or typed the word(s). Unwanted words or sentences were deleted off the draft. Once the revisions were completed with Google Voice Typing, there was no evidence that any changes had occurred.

The appearance of the revised compositions looked completely different. The improvements on the handwritten compositions looked messy and in disarray because of the markings, but came together when writing the final draft. Google Voice Typing compositions slowly morphed into the final drafts with each new revision. Every time a revision was made, the old part no longer existed. Because there were no markings or visual evidence that a revision was made, the appearance of the Google Voice Typing compositions looked neater, cleaner, and in order.

Editing. Editing changed in three ways when comparing handwriting to Google Voice Typing. The goal was the same; make corrections in capitalization, punctuation,

and spelling. The first change occurred in how the participants edited; the second change happened with the appearance of the edits; and the third change occurred when editing was finished.

The writing mode changed as participants edited handwritten compositions and Google Voice Typing compositions. Edits were handwritten on the rough drafts of the handwritten compositions with a colored pen. Proofreaders' marks were seen throughout the compositions and were corrected when recopying the final drafts. On the Google Voice Typing compositions, edits were voiced or typed (Wetzel, 1996). Edits were corrected as participants found them, leaving no proofreaders' marks on the compositions. Handwritten edits were easier than voicing edits; in fact, most Google Voice Typing edits were typed, not voiced by participants.

The appearance of edits on the handwritten compositions compared to the Google Voice Typing compositions looked different. The edits on the handwritten compositions appeared messy due to the proofreaders' marks, while the edits on Google Voice Typing transformed the compositions into polished pieces. Proofreaders' marks are necessary on handwritten compositions in order for writers to know where to correct editing mistakes; therefore, the messiness was unavoidable. Although edits were made with Google Voice Typing, once corrected, there was no trace that any occurred because there are no proofreaders' marks.

When edits were completed, the handwritten pieces were ready to be rewritten into a final draft, whereas the Google Voice Typing compositions were in a final draft and did not have to be rewritten. Revising and editing with Google Voice Typing saved the participants from having to recopy the entire compositions for publication.

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Publishing. Publishing changed in three ways when comparing handwritten compositions to Google Voice Typing. The first change occurred in how participants published the compositions; the second change occurred with the length of compositions; and the third change occurred in the appearance of published compositions.

To publish handwritten compositions, participants rewrote their rough draft, making sure to include all revisions and edits. They all used pencils except Peniqua, who used a purple pen. Rewriting the compositions for publishing took time and energy from the participants. Trixie struggled the most, as handwriting the entire composition over again became too strenuous. She needed assistance and encouragement. Johny had an issue as well. When copying the rough draft to the final handwritten draft, Johny lost his place. He accidentally wrote part of a sentence over again, when moving to the next line of the paper. Publishing with Google Voice Typing was much faster and easier for participants. It required little time or energy. When participants were finished with revising and editing their compositions with Google Voice Typing, they could automatically publish. Therefore, an entire step was eliminated when publishing with Google Voice Typing. This brought joy to all of the participants.

The number of words written in final drafts differed between handwritten and Google Voice Typing compositions (Table 29). Each participant wrote more words when they used Google Voice Typing. Both compositions Trixie, Johnny, and Sam created with Google Voice Typing had more words than their handwritten compositions (Quinlan, 2004; Schneider et al., 2013). Peniqua's last three compositions had about

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the same number of words, which was about twice as much as the first composition.

Spontaneous Google Voice Typing compositions had the most words for Peniqua (89),

Trixie (165), and Johny (391), while the Google Voice Typing composition planned

with a narrative guide had the most words for Sam (263). The average numbers of

words for handwritten/spontaneous, handwritten with a narrative guide, Google Voice

Typing/spontaneous, and Google Voice Typing with a narrative guide were 69, 75, 198,

and 176, respectively. On average, Google Voice Typing final drafts had more words

than handwritten final drafts.

Table 29

Total Number of Words and Mean Number of Words in Final Drafts

			Total # of Words			
Participant	HWS	HWNG	HW Totals	GVS	GVNG	GV Totals
Peniqua	42	82	124	89	80	169
Trixie	81	62	143	165	147	312
Johny	62	72	134	391	213	604
Sam	90	83	173	148	263	411
Totals	275	299	574	793	703	1496
Mean # of Words (rounded to nearest whole)	69	75	144	198	176	374

Note. Handwritten, spontaneous = HWS; Handwritten, narrative guide = HWNG;
Google Voice Typing, spontaneous = GVS; Google Voice Typing, narrative guide =
GVNG; Handwriting = HW; Google Voice Typing = GV; Mean # of Words = Totals/4

Handwritten publications and Google Voice Typing publications looked completely different. Peniqua, Trixie, and Sam published handwritten compositions on notebook paper, but Johny chose to publish on construction paper. Google Voice Typing compositions were published on printer paper. Handwritten compositions were written in cursive or print, whereas Google Voice Typing compositions were typed in a font chosen by the participants. For the most part, neatness, letter formation, and spacing between letters occurred naturally with Google Voice Typing, but errors were more noticeable in handwritten compositions. All of the participants felt their compositions looked neater and "nicer" when typed and printed with Google Voice Typing.

Discussion

The results from the study indicated that participants had a positive view of Google Voice Typing. Participants liked that Google Voice Typing: 1) helped with thinking and saying words quicker; 2) helped with not forgetting thoughts; 3) made writing easier; and 4) produced better compositions. When using Google Voice Typing, participants did not like: 1) editing; 2) dictating the punctuation; and 3) misrecognitions. Advantages existed for both handwriting and Google Voice Typing. Advantages for handwriting included: 1) prewriting (time spent planning with a narrative guide); and 2) editing (easier, but the number of errors for conventions differed between handwriting and Google Voice Typing). Advantages for Google Voice Typing included: 1) drafting (reduced transcription load, more working memory, more words per minute); 2) revising (better ideas and word choice); and 3) publishing

(better presentation, included more words and sentences, did not have to rewrite a final draft).

Prewriting was influenced by whether participants planned with a narrative guide or without a narrative guide. Providing a narrative guide or graphic organizer (Schneider et al., 2013; Quinlan, 2004), lead participants to spend more time planning what they wanted to write about. Narrative guides were handwritten. Using a narrative guide to plan a composition was extremely helpful to participants. When rating individual compositions by how well it told a story or conveyed information, three of the four participants gave the highest rating to a composition planned with a narrative guide. Two participants gave the highest rating to a handwritten composition, one participant rated Google Voice Typing highest, and the fourth participant rated all four compositions the same regardless of using a narrative guide. When planning spontaneous handwritten compositions, participants planned very little to not at all. Most of the participants created outlines when planning spontaneous Google Voice Typing compositions.

When planning what to write about, Google Voice Typing required the participants to think about what to write in advance (Baker, 2016; Gardner, 1980). Once the microphone turned on, the participants had to be ready to dictate, otherwise the microphone had to be turned back off. Being ready meant they had to know what they wanted to say when the microphone turned on because Google Voice Typing dictated every word. If they were not ready, Google Voice Typing captured unwanted sounds or utterances. In order to be ready, Trixie orally rehearsed what she wanted to say before turning on the microphone and dictating with Google Voice Typing (Wetzel,

1996; Baker, 2016), and Peniqua glanced at the narrative guide before dictating. Also, when pausing to think, participants had to remember to turn the microphone on and off. Handwriting did not require the same kind of readiness. When participants were ready to write, they started writing with a pencil or pen and did not have to worry about unwanted words being placed on the paper. They controlled what was written and could easily pause and ponder without worrying about a microphone recording unwanted words.

Google Voice typing gave participants an easier way to draft compositions (Baker, 2016). When drafting a handwritten composition, participants used paper and pencil (or pen), but with Google Voice Typing, they used their voice. Google Voice Typing made a difference with translation. Translation is the process of transforming ideas into visible language (Flower & Hayes, 1981). For beginning and developing writing, translation is subdivided into the text generator and the transcriber (Berninger et al., 1992). Transcription has two writing modes, graphomotor (handwriting/typing) and speech-based (Google Voice Typing). Transcription mode was important because the more demanding it was, the more it interfered with other writing processes (Hayes, 2012). With the exception of Peniqua's second handwritten composition, handwriting interfered with composing. The total amount of words in final drafts produced with Google Voice Typing was considerably higher than handwriting. Like other studies (De La Paz, 1999; MacArthur & Cavalier, 2004; MacArthur et al., 2016; Quinlan, 2004) have shown, when composing via handwriting, participants' working memory focused on handwriting (low-level transcription concern) leaving less working memory for content generation (high-level compositing concerns). This interference caused

participants to forget thoughts and ideas, because they could not write as fast as they could think (De La Paz, 1999). Dictation with Google Voice Typing permitted closer synchrony between thoughts and word production (Gardner, 1980), allowing participants to capture ideas before they were forgotten (De La Paz, 1999). Participants benefitted from using Google Voice Typing because it reduced transcription load, leaving more working memory for text generation (Quinlan, 2004).

There were several additional findings related to drafting (Table 28). First, the composing times differed from handwriting and Google Voice Typing (unlike the findings of MacArthur & Cavalier, 2004). At times, handwriting was quicker and other times Google Voice Typing was quicker. On average, handwriting was quicker than Google Voice Typing (23 minutes and 25 minutes, respectively). Second, Google Voice Typing had more words on rough drafts than handwritten compositions. Google Voice Typing drafts averaged 360 words compared to 130 words on handwritten drafts. Third, Google Voice Typing produced more words per minute than handwriting, although at times drafting took longer in Google Voice Typing than handwriting. Handwritten compositions averaged 12 words per minute and Google Voice Typing averaged 39 words per minute.

Google Voice Typing benefitted from the revision process as participants made improvements to their compositions, resulting in longer final drafts compared to handwritten compositions. At times, participants used their voice to make changes to the rough draft, but mostly used typing for Google Voice Typing compositions. With handwriting, revisions were handwritten on the rough draft. Handwritten drafts tended to look messy and unorganized, while Google Voice Typing drafts looked polished and

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organized. Additionally, Google Voice Typing influenced how participants ranked the writing traits associated with the revision process. Three out of four participants ranked Google Voice Typing compositions best in the traits of ideas and word choice. Because a tie occurred with one participant in organization and sentence fluency, it could not be determined if Google Voice Typing or handwriting ranked higher for those traits. Google Voice Typing tied with handwriting with regard to voice.

When making edits, or corrections, in conventions (e.g. capitalization, punctuation, and spelling), it was easier for participants to handwrite the corrections than it was to use Google Voice Typing. When using Google Voice Typing, participants usually typed the corrections, rather than use their voice; therefore, Google Voice Typing required more work than handwriting, as participants had little to no experience with typing. To edit a composition via handwriting, the participant used a pen and marked the correction, but with Google Voice Typing, the participant moved the cursor to the right position, deleted the error, typed the correction, and made sure the caps lock was on or the shift key was down when appropriate.

Although it was easier to correct capitalization errors via handwriting, participants made more capitalization errors with handwriting than Google Voice Typing, 20 and 12, respectively (Table 27). Handwriting punctuation was automatic for most participants, but with Google Voice Typing they had to remember to say the punctuation as they dictated, which was a new skill. As a result, Google Voice Typing had one more punctuation error compared to handwriting (20 errors and 19 errors, respectively). Google Voice Typing did not make spelling errors, yet Trixie had spelling errors due to making revisions via typing. More errors in spelling were made

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with handwriting than Google Voice Typing (11 and 4, respectively), supporting the findings of MacArthur & Cavalier (2004), Schneider et al. (2013), and Quinlan (2004). Additionally, when ranking their compositions in terms of conventions, three out of four participants ranked Google Voice Typing higher than handwriting.

Google Voice Typing influenced how participants viewed their published drafts. When comparing all four of their own compositions, three out of four participants felt their Google Voice Typing compositions were better than the handwritten compositions. All four participants thought the compositions looked "nicer", ranking Google Voice Typing highest on presentation. Although the look of a composition influenced how participants viewed their compositions, they seemed to forget that neatness was only one important part of presentation. While there were a few discrepancies in letter shape and form, slant, and spacing, the participants' handwriting was mostly legible and consistent. Yet, in their eyes, the Google Voice Typing compositions still looked superior because they believed their handwriting was visually inferior to the typed compositions.

An important part of presentation is effective integration of illustrations (Culham, 2003). Johny was the only participant to add hand drawn illustrations to his handwritten compositions. He failed to see the significance of his illustrations when ranking his compositions. He rated Google Voice Typing best in terms of presentation over his handwritten compositions, which included illustrations. Had he written those compositions with Google Voice Typing, would the illustrations not have been drawn? His illustrations added personality, creativity, and originality to both of the handwritten compositions, which was an important part of presentation.

Two significant findings in favor of Google Voice Typing included: 1) published compositions composed with Google Voice Typing included more words and sentences than handwritten compositions; and 2) Google Voice Typing eliminated the need to rewrite a final draft. When comparing the total number of words (Table 29) and sentences (Table 25), Google Voice Typing compositions had 1,496 words and 118 sentences compared to handwritten compositions that had 574 words and 59 sentences. Publishing with Google Voice Typing was simple, because revised and edited compositions were ready for immediate publication. Not only did this save time, but it was a great motivator as well. To publish a handwritten composition, the entire rough draft had to be rewritten to include revisions and edits, which was challenging for some participants.

Optimal protocol. Based on the experiences of the four participants, the following protocol would give the optimal mix of conditions for children.

Prewriting. Participants benefitted from using a narrative guide to plan their compositions. A graphic organizer helps children choose a topic, gather and organize ideas, consider the audience and purpose for writing, and choose an appropriate genre. Provide children with a graphic organizer for prewriting.

Drafting. Participants drafted more words on rough drafts and more words per minute when using Google Voice Typing. Train children on how to properly use Google Voice Typing, by speaking clearly and consistently, dictating punctuation, and using commands. After training children on how to use Google Voice Typing, allow them to dictate a rough draft using Google Voice Typing. Be creative in choosing a font, font size, and font color.

Revising. Revising with Google Voice Typing resulted in neater compositions, more words on final drafts, and eliminated the need to rewrite a final draft. Dictate longer sentences and paragraphs, but type single or multiple words when adding or substituting revisions. Use the copy and paste functions to move text from one place to another. Delete unwanted words, sentences, and paragraphs.

Editing. Typing edits, instead of dictating edits, was easier with Google Voice Typing. When editing, correct errors in capitalization, punctuation, and spelling. Check grammar and paragraphing too. If the spell checker is on, Google Voice Typing will underline misspelled words and give suggestions for the correct spelling of words.

Publishing. Upon completion of revisions and edits, the Google Voice Typing composition is ready to print. Check that fonts are appropriate and the composition has a title before printing. To personalize the composition before printing, insert images or photos; and after printing, hand draw images to the printed composition.

Implications for Practice

The results of this study have important implications for teachers and schools. In this study, participants responded positively to using Google Voice Typing to write. Google Voice Typing gave them an alternative method of writing, as most participants expressed dislike for handwriting. Students who are reluctant writers, or who struggle with poor handwriting or writing skills may benefit from using Google Voice Typing for writing assignments.

The writing environment for this study was somewhat artificial. When handwriting a composition, participants handwrote through each phase of the writing process. When dictating a composition with Google Voice Typing, participants dictated

or typed through each phase of the writing process, except when planning with the narrative guide, participants handwrote the answers. Teachers should use mixed conditions when implementing Google Voice Typing into the classroom. For example: Prewriting (handwriting); Drafting (Google Voice Typing); Revising (typing); Editing (handwriting or Typing); and Publishing (Google Voice Typing). The goal for teachers is find the best combination to help each student with translation (getting ideas into visible language).

Although Google Voice Typing did not have an effect on all aspects of writing, all of the traits could certainly be taught and implemented using Google Voice Typing instead of paper and pencil. Many of the activities Culham (2003) presented can be used with Google Voice Typing. Below are a few activities that Culham created that have been adapted for use with Google Voice Typing:

Ideas: Building Block. Students dictate and construct more interesting and detailed sentences with these building blocks: "When," "Size or Color," "Place," and "Name."

Example:	When:	*Last night, the dog howled.*
	Size:	*Last night, the enormous dog howled.*
	Name a Place:	*Last night, the enormous dog howled outside my window.*
	Add a name:	*Last night, the neighbor's enormous dog howled outside my window.*

Organization: Step-by-Step. Students dictate the directions for an activity such as making a peanut butter sandwich. Classmates follow the printed instructions.

Voice: Shopping List. Turn a simple grocery list into a voice-rich writing task.

Students dictate a list of five items. Students dictate a paragraph about some or all

items on the list in an original, thoroughly entertaining way.

Word Choice: Is More Always Better? Students rewrite, by dictation, common

signs such as road signs, warning signs, business signs, etc., using flowery and highly

descriptive language. Compare the original to the rewrite and determine which is more

effective.

Sentence Fluency: Pass It On. The teacher gives students a short beginning

sentence. Students take the last word of the sentence and begin the next sentence with

that word. Keep going until the story is finished.

Conventions: The teacher rewrites a short story by omitting all punctuation,

capitalization, and indentions. The teacher gives students copies of the story and has

them dictate the story, with all the conventions. They compare to the original and note

any difference.

Google Voice Typing can be used for each phase of the writing process. During

prewriting, students can generate ideas by dictation. A few activities include: making

lists, creating outlines, and dictating 3-5 minute quickwrites. When drafting, students

use good dictation skills and pour out their ideas without worrying about revising or

editing. Speaking instead of handwriting can sometimes be easier when getting

thoughts down and students are "less likely to censor their writing because they know

how easy it is to make changes" (Tompkins, 2012, p. 26). Revising is challenging with

Google Voice Typing, but with practice can become useful. Students can add,

substitute, delete or move words, sentences and paragraphs by their voice or with

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typing. To edit, typing might be easier when correcting capitalization and punctuation.

Spelling errors should not occur unless the student typed a word incorrectly.

Misrecognitions should be corrected at this time as well. Finally, when publishing with

Google Voice Typing, students just click the print button and the final draft is complete.

With Google Voice Typing, students do not write a final draft. Students who struggle

with handwriting final drafts, or are reluctant to write the final draft, might find more

motivation to write if they did not have to spend time rewriting the rough draft. With

Google Voice Typing, the final draft is developed and ready for publication as soon as

revisions and edits are completed.

Training. Teachers need to make a plan for how to train students to use Google

Voice Typing. Fudickar (2017) provides a plan for teachers to implement Google

Voice Typing into the classroom. The teacher first creates a Google account and

becomes familiar with Google Docs in a Chrome Brower. Earbuds with a built-in

microphone work best for dictation. There are three phases of implementation:

Teacher modeling, Teacher and student demonstrations, and Independent practice.

Teacher modeling. Phase one has three steps: planning the lesson, introducing

the lesson, and modeling the lesson. First, the teacher becomes familiar with the

technology by practicing good dictation skills (e.g. speaking clearly, dictating

punctuation, using commands). Second, the lesson is introduced to students along with

a discussion about Google Voice Typing. Third, the teacher models how to use Google

Voice Typing by using the Google Voice Typing Tutorial.

Teacher and student demonstrations. Phase two is a time for students to

explore with the technology. Teachers work one-on-one with students or in small

groups. Students are given time to become familiar with Google Voice Typing and are guided through the Google Voice Typing Tutorial. Students dictate a story, practicing good dictation skills before being given their assignment.

Independent practice. During phase three, students are given an assignment to work on independently. They are given a Google Voice Typing Basic Commands sheet to assist them when dictating. Students create a composition using Google Voice Typing.

Limitations

Case studies are selected in qualitative research to understand, in depth, a particular case (or cases). The focus is not on finding what is true for many. Yet, much can be learned from studying a case. This multiple-case study was limited to four students; therefore, findings cannot be generalized to all students who struggle with writing. However, the findings can be helpful to teachers who are looking for alternative writing tools for struggling writers.

Participation in this study was limited to students to whom I had access. The perspective of the participants' teachers could have added insight into the writing behaviors of the children at school. Teachers could have shared how students responded to writing assignments, their attitude towards writing on a daily basis, and their handwriting capabilities. Likewise, learning about the writing behaviors of the children at home, from the perspective of parents would have been helpful. Parents could have shared how children responded to homework and their attitudes towards writing at home.

Finally, as a reluctant writer, personal bias exists with regard to the effectiveness of Google Voice Typing to compose. I also struggle with writing. Finding alternative methods of writing that work is important to me. Efforts to limit bias were undertaken through the use of multiple sources of data: interview questions, observations, and documents, and reporting both positive and negative outcomes related to Google Voice Typing.

Future Research

One area of future research should look at the number of students who could use Google Voice Typing at one time. Because Google Voice Typing records sounds, the environment must be free of noise. Is it possible for a classroom of students to use Google Voice Typing at one time in a computer lab? Or would Google Voice Typing dictate the voices of other students? Is Google Voice Typing limited to one student working alone in a quiet environment?

Another area of future research should investigate the quality of handwritten compositions compared to Google Voice Typing compositions. For example, do students produce better quality essays when composing with Google Voice Typing? As students become more familiar with Google Voice Typing and use it regularly, do their compositions improve? Other questions worth exploring: How does Google Voice Typing compare to Dragon Speech Recognition Software or Siri? What percent of schools use Google Chromebooks? Of that percent, how many allow students to use Google Voice Typing? Do schools know about Google Voice Typing? If so, are schools and students using Google Voice Typing? What is an appropriate age to introduce students to voice to text?

This study provided insight into the perspectives of students using Google Voice Typing to compose. Technology will continue to improve and develop, and voice technology is not going away. This is evident in the development of current voice-activated technologies, like voice-activated TV remotes (e.g. Apple TV, Amazon Firestick, etc.); voice-activated speakers (e.g. Alexia, Google Home); and voice-activated digital assistants on mobile devices (e.g. Siri, Google Now, Cortana, etc.). It is important for schools and teachers to keep up with current technologies and offer students opportunities to use technology that is beneficial and proven to help reluctant writers or students that struggle with writing and handwriting.

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Appendix A: Signed Parental Permission to Participate in Research

Signed Parental Permission to Participate in Research

Will you allow your child to be involved in research at the University of Oklahoma?

I am Jenny Fudickar from the Instructional Leadership and Academic Curriculum department and I invite your child to participate in my research project entitled Elementary Students Use Google Voice Typing to Write. This research is being conducted at The Academy of Classical Christian Studies. Your child was selected as a possible participant because his/her teacher believed they could benefit from learning how to use Google Voice Typing to write.

Please read this document and contact me to ask any questions that you may have BEFORE allowing your child to participate in my research.

What is the purpose of this research? The purpose of this research is to understand how elementary age students' use voice-to-text, more specifically Google Voice Typing, to compose. The research questions that guide this study are as follows: How do students respond to using voice-to-text as a method of composing? What effect, if any, does voice-to-text have on the content, appearance, or other features of compositions? How does voice-to-text change the composing process for students?

How many participants will be in this research? About 5 students will take part in this research.

What will my child be asked to do? If you allow your child to be in this research, s/he will be asked to attend a Technology Writing Workshop for 5 sessions. Each session is video or audio recorded. During Session 1, your child will complete an Elementary Writing Attitude Survey. The survey has 28 questions about his/her attitude towards writing. It takes about 20 minutes to complete. Then your child will write two narrative pieces of writing using paper and pencil. The first composition will be a spontaneous writing and the second composition will be a planned writing. During Session 2, your child will be trained on how to write using Google Voice Typing. Training will take about 2 hours. During Session 3, your child will use Google Voice Typing to compose two narrative writings. The first composition will be a spontaneous writing and the second composition will be a planned writing. This will take about 1.5-2 hours. During Session 4, your child will complete the Elementary Writing Attitude Survey again. Then, I will interview your child and ask questions about using Google Voice Typing to write. This interview is a face-to-face recorded interview. Your child will answer a lot of questions. These questions will ask about your child's experience with using Google Voice Typing. This will take about 1 hour. During Session 5, your child will have a chance to review the transcript of the interview and clarify any points. There may be a few answers that I need your child to clarify as well. This will take about 30 minutes to 1 hour.

How long will this take? Your child's participation will take about two hours each session over 5 sessions. Each session is scheduled based on your needs (i.e., after school, weekend, etc.).

What are the risks and/or benefits if my child participates? No harm will come to your child. At times, they may become frustrated when writing and learning the new technology. Yet, learning how to use Google Voice Typing could be beneficial to your child.

Will my child be compensated for participating? Your child will not be compensated for participating.

44 **Who will see my child's information?** In research reports, there will be no information that
45 will make it possible to identify your child. Research records will be stored securely and only
46 approved researchers and the OU Institutional Review Board will have access to the records.

47 You have the right to access the research data that has been collected about your child as a
48 part of this research. However, you may not have access to this information until the entire
49 research has completely finished and you consent to this temporary restriction.

50 **Does my child have to participate?** No. If your child does not participate, s/he will not be
51 penalized or lose benefits or services unrelated to the research. If your child does participate,
52 s/he doesn't have to answer any question and can stop participating at any time.

53 **Will my child's identity be anonymous or confidential?** Your child's name will not be
54 retained or linked with her/his responses. The data will be retained in anonymous form at the
55 end of the research.

56 **Will my child's personal records be accessed?** If you approve, your child's confidential
57 records will be used as data for this research. The records that will be used include two
58 Elementary Writing Attitude Surveys, two handwritten narratives, two oral narratives using
59 Google Voice Typing, two graphic organizers, four narrative mode guides, observations of
60 each session, an interview and transcription of the interview. These records will be used for the
61 following purpose(s): The Elementary Writing Attitude Surveys are used to determine your
62 child's attitude toward writing. S/he will take the survey at the beginning and end of the
63 workshop. The researcher will use this data to see if your child's attitude changed after
64 learning how to use Google Voice Typing to write. Additionally, it might show how your child
65 responded to using voice-to-text. The narratives, graphic organizers, and narrative mode
66 guides will be used to determine what effect, if any, did voice-to-text have on the content,
67 appearance, or other features of your child's compositions. The observation documents and
68 interview will be used to answer each of the research questions listed above.

69 I agree for my child's records to be accessed for research purposes.   ___Yes ___ No

70 **Audio Recording of Research Activities** To assist with accurate recording of your child's
71 responses, interviews are recorded on an audio recording device. You have the right to refuse
72 to allow such recording without penalty.

73 I consent to audio recording.   ___ Yes   ___ No

74 **Video Recording of Research Activities** To assist with accurate recording of your child's
75 responses, interviews and observations may be recorded on a video recording device. You
76 have the right to refuse to allow such recording.

77 I consent to video recording.   ___ Yes   ___ No

78 **Photographing of Research Participants/Activities** In order to preserve an image related to
79 the research, photographs may be taken of your child, but we will not include any images of
80 their face. You have the right to refuse to allow photographs to be taken.

81 I consent to photographs.   ___ Yes   ___ No

82 **Will I be contacted again?** The researcher would like to contact you again to recruit your child
83 into this research or to gather additional information.

84 _____ I give my permission for the researcher to contact me in the future.

85 _____ I do not wish to be contacted by the researcher again.

86 **Who do I contact with questions, concerns or complaints?** If you have questions,
87 concerns or complaints about the research or have experienced a research-related injury,
88 contact me at 405-488-4391 or jfudickar@theacademyok.org. You can also contact my
89 advisor, Dr. Lawrence Baines at 405-325-3752 or lbaines@ou.edu.

90 You can also contact the University of Oklahoma – Norman Campus Institutional Review
91 Board (OU-NC IRB) at 405-325-8110 or irb@ou.edu if you have questions about your child's
92 rights as a research participant, concerns, or complaints about the research and wish to talk to
93 someone other than the researcher(s) or if you cannot reach the researcher(s).

94 *You will be given a copy of this document for your records. By providing information to the*
95 *researcher(s), I am allowing my child to participate in this* research.

Parent's Signature	Print Name	Date
Child's Name		
Signature of Researcher Obtaining Consent	Print Name	Date
Signature of Witness (if applicable)	Print Name	Date

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Appendix B: Signed Child Assent (7-11 years)

Signed Child Assent (7-11 years)

Why are we meeting with you?
I am Jenny Fudickar from the University of Oklahoma. We are doing a research project to learn about using Google Voice Typing to write. Google Voice Typing records your voice and turns it into text, so instead of typing words, you speak them. We want to learn how students respond to using Google Voice Typing as a method of writing. We also want to know what effect, if any, does Google Voice Typing have on the content, appearance, or other features of compositions. Lastly, we want to learn how Google Voice Typing changes the composing process for students. We are asking you to help because we want to learn from kids like you. In the whole research project, there will be about 5 children who participant in this study.

What will happen to you if you are in this research project?
If you agree to be in this research project, we are going to ask you to attend a Technology Writing Workshop every week for 5 sessions. Each session is video recorded. During Session 1, you will complete an Elementary Writing Attitude Survey. The survey has 28 questions about your attitude towards writing. It takes about 20 minutes to complete. Then you will write two narrative pieces of writing using paper and pencil. The first composition will be a spontaneous writing and the second composition will be a planned writing. During Session 2, you will be trained on how to write using Google Voice Typing. Training will take about 2 hours. During Session 3, you will use Google Voice Typing to compose two narrative writings. The first composition will be a spontaneous writing and the second composition will be a planned writing. This will take about 1.5-2 hours. During Session 4, you will complete the Elementary Writing Attitude Survey again. Then, I will interview you and ask you questions about using Google Voice Typing to write. This interview is a face-to-face recorded interview. You will answer a lot of questions. These questions will ask about your experience with using Google Voice Typing. This will take about 1 hour. During Session 5, you will have a chance to review the transcript of the interview and clarify any points that you would like to make. There may be a few answers that I need you to clarify as well. This will take about 30 minutes to 1 hour.

How long will you be in the research project?
You will be in the research project for about two hours each session for 5 sessions. The research project will be at The Academy of Classical Christian Studies in Jenny Fudickar's classroom.

What bad things might happen to you if you are in the research project?
Your Mom or Dad will have to give their permission for you to help me. I have told them about the bad and good things and they said it was ok for you to work with me. No bad things will happen to you. You may feel frustration when writing and learning how to use Google Voice Typing.

What good things might happen to you if you are in the research project?
You may have fun playing with Google Voice Typing. You may find that you enjoy using it to write. It is possible that your teacher will allow you to use it for writing assignments.

Do you have to be in this research project?

48 No, you don't. No one will be mad at you if you don't want to do this. If you don't want to do
49 this, just tell me. If you do want to be in the research project, tell me that. You can say yes now
50 and change your mind later. It's up to you.
51
52 **Do you have any questions?**
53 You can ask questions any time. You can ask now. You can ask later. You can talk to me or
54 you can talk to someone else. If you sign this paper, it means that you understand what this
55 letter says and want to be in the research project. If you don't want to be in the research
56 project, don't sign this paper. Being in the research project is up to you, and no one will be
57 upset if you don't sign this paper or if you change your mind later.
58
59 The person who talks to you will give you a copy of this form to keep.
60

Signature of Child	Date

61

62 **SIGNATURE OF PERSON CONDUCTING ASSENT DISCUSSION**
63 I have explained the research project to _____(*print name of child here*)
64 in language he/she can understand, and s/he has agreed to be in the research project.
65

Signature of Person Conducting Assent Discussion	Date
Name of Person Conducting Assent Discussion (*print*)	

66

Appendix C: Assessment Guides

Grades 1 - 2   Mode : Narrative

Purpose: To Tell a Story.

6
5
I've Got It !

- My story is my own idea.
- I've come up with cool characters.
- I can see my setting in my mind.
- Everything that happens makes sense.

4
3
On My Way

- My story is pretty ordinary.
- My characters are kinda blah.
- My setting is a little fuzzy.
- Parts of my story don't make sense.

2
1
Just Starting

- My story isn't finished.
- I've come up with only one character.
- My setting is unclear.
- I can't follow my story. Oh no!

Grades 1 - 2

Mode Expository :
Informational / Explanatory

Purpose: To report or convey information

6

I've Got It !

5

- I know a lot about this topic.
- I used information and facts.
- My reader will learn something new.
- I stuck with my topic.

4

On My Way

3

- I've only written what I know.
- I used one or two facts.
- My reader might have questions.
- I sorta stuck with my topic.

2

Just Starting

1

- My topic is unclear.
- I didn't use any details or facts.
- Oh no! I'm confused and my reader will be, too.
- I need to think more about my topic.

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Grades 3 - 5

Mode : Narrative

Purpose: To Tell a Story.

I've Got It !

6

5

- My story has a solid plot with a conflict that is resolved. Yes!
- I have come up with several fresh and original characters.
- There is a setting I can see in my mind.
- Each event moves the story forward logically.

On My Way

4

3

- My story has a predictable plot with a conflict, but not much of a resolution.
- My characters are not very fresh or original.
- My setting is pretty ho hum. I can do better here.
- My story moves forward predictably.

Just Starting

2

1

- My plot is thin and there is no real conflict.
- I've only come up with one ordinary character.
- Oops! I forgot to include a setting.
- My story isn't finished, and the parts don't fit together well.

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Grades 3 - 5

Mode Expository :
Informational / Explanatory

Purpose: To report or convey information

I've Got It !

6

5

- I've covered my topic well, using specific details and facts.
- My information is both accurate and fascinating.
- I've answered questions for the reader.
- I stayed focused on my topic and developed it.

On My Way

4

3

- I gave an overview of my topic.
- My information is pretty ordinary and maybe inaccurate. I better do a fact check.
- I don't think I've answered my readers' questions.
- I tried to stay focused on my topic, but wandered here and there.

Just Starting

2

1

- I don't know much about my topic at all.
- I don't provide much information and didn't check my facts.
- My reader will wonder what I am writing about.
- Yikes! I need to rethink my topic.

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Appendix D: Narrative Guide

Narrative Guide

Name:

Title:

Plot:	Setting:
	Location:
Conflict: (circle one)	Weather:
character/nature character/society	Time:
between characters a character	Time Period:
Theme:	Point of View: (circle one)
	first person omniscient
	limited omniscient objective

Character(s): (Name each character, describe their appearance, and write something about them)

      Dialogue: Yes or No   Monologue: Yes or No

Appendix E: Interview Questions

Interview Protocol

Introduction

Thank you for your time and willingness to participate in this research study. As you know, I am interested in investigating how voice-to-text assists students with writing. Particularly, I am interested in how you respond to using Google Voice Typing as a method of writing. I am also interested in what effect Google Voice Typing has on the content, presentation, or other features of your writing. Lastly, I am interested in how Google Voice Typing changes the composing process for you.

Interview Questions

1. What do you think are the most important characteristics of a writer?
2. How do you see yourself as a writer?
3. What do you enjoy about writing? Dislike about writing?
4. What aspects of Google Voice Typing do you like?
5. How did you feel about using Google Voice Typing to write?
6. What was difficult or easy about using Google Voice Typing?
7. How would you describe your attitude toward writing after using Google Voice Typing?
    a. How did your attitude improve towards writing?
    b. How did your attitude worsen towards writing?
8. How would you describe your confidence in writing after using Google Voice Typing?
9. What are your thoughts and feelings about using Google Voice Typing to write in the future?
10. What would be your recommendation for using Google Voice Typing to write?
11. Let's look at your scoring rubrics. Tell me about the scores you gave yourself.
12. How would you describe your writing after using Google Voice Typing?
13. How would you describe your ability to express your ideas when using Google Voice Typing compared to the handwritten narrative? Your ideas or topic are what make up the content of your writing. Rank in order of best to worst ideas.

14. How would you describe the organization of your narratives when using Google Voice Typing compared to the handwritten narratives? Rank in order of best to worst organization.

15. How would you describe your voice (mood, tone, style and individual personality) when using Google Voice Typing compared to the handwritten narrative? Rank in order of best to worst your voice.

16. How would you describe your word choice when using Google Voice Typing compared to the handwritten narrative? Word choice is the precise language you use in your writing. Rank in order of best to worst word choice.

17. How would you describe sentence fluency (to communicate ideas in writing accurately and quickly with little effort) when using Google Voice Typing compared to the handwritten narrative? Rank in order of best to worst sentence fluency.

18. How would you describe conventions (mechanics, like spelling, capitalization, and punctuation) when using Google Voice Typing compared to the handwritten narrative? Rank in order of best to worst conventions.

19. Do you think your handwritten narratives or Google Voice Typing narratives have a better presentation? Explain. Rank in order of best to worst presentation.

20. What are some of the tools you have used in the past to write?

21. What technologies have you used in the past to write?
    a.   Computers, iPads, iPhones, Siri

22. How does Prewriting (developing goals and generating ideas) change when using Google Voice Typing?

23. How does Drafting (creating a preliminary version of text) change when using Google Voice Typing?

24. How does Revising (making content changes to clarify) change when using Google Voice Typing?

25. How does Editing (making changes to conventions) change when using Google Voice Typing?

26. How does Publishing change when using Google Voice Typing?

27. How would you describe the time needed to complete your writing assignments when using Google Voice Typing compared to handwriting?

28. How would you describe your writing after using Google Voice Typing?

29. How do you think Google Voice Typing influenced (helped or worsen) your writing?

Closing

Thank you for participating in this interview. Now that we are done, do you have any questions you'd like to ask me about this research project? I want to assure you that your responses are confidential. After I transcribe our interview and write my report, I will use a pseudo or fake name for you. I will also let you read through my report to ensure that I have everything correct. Therefore, I may need to contact you later for additional questions or clarification. Can I have your follow-up contact information? If you want to contact me later, here is my contact information: Jenny Fudickar, 405-488-4391, jfudickar@theacademyok.org

Appendix F: Observation Checklist

Observation Checklist	
The Physical Setting:	
• What is the physical environment like?	
• What is the context?	
• What kinds of behavior is the setting designed for?	
• How is space allocated?	
• What objects, resources, technologies are in the setting?	
The participants:	
• Describe who is in the scene.	
• What are the relevant characteristics of the participant?	
• What are the ways in which the people in this setting organize themselves?	
Activities and interactions:	
• What is going on?	
• How do the people interact with the activity?	
• How are people and activities connected?	
• When did the activity begin?	
• How long did it last?	
• Is it a typical activity, or unusual?	
Conversation:	
• What is the content of conversations is this setting?	
• Who speaks and who listens?	
Subtle factors:	
• Informal and unplanned activities	
• Symbolic and connotative meanings of words	
• Nonverbal communication such as dress and physical space	
• Unobtrusive measures physical clues	
• What did not happen?	

(Merriam & Tisdell, 2016, p. 141).

Appendix G: Subjectivity Statement

The purpose of this study was to explore how elementary students responded to using Google Voice Typing to compose, the effect Google Voice Typing had on features of compositions, and changes that occurred in the composing process for students when using Google Voice Typing. Four students, in 2nd, 3rd, and 4th grades, attended a Technology Writing Workshop over five sessions.

Similar to three of the participants in this study, I am a reluctant writer. In order to overcome some of my fears associated with writing, I enrolled in the Oklahoma Writing Project Summer Institute in 2013. Not only did I learn how to teach writing, but I also learned how to enjoy writing as an author. The Oklahoma Writing Project Summer Institute helped me find my voice, which I want to pass on to children. Children that lack the motivation to write need help seeing the benefits of writing. As an educator, I am always looking for new and innovative ways to motivate children. When Dr. Baines suggested looking into voice-to-text technology, I soon realized the potential it had to support reluctant writers or children with poor writing or handwriting skills. I conducted a pilot study with one participant, using Dragon Speech Recognition software to compose. It was very difficult for her to use, so I researched different products and found Google Voice Typing. It was kid-friendly, easy to get access to, and free (unlike Dragon Speech Recognition).

My insecurities and experiences with writing can be both a strength and limitation for this study. I can relate to the participants in this study. I understand the challenges they face when composing, because I face similar challenges in my academic journey. However, my struggles, views, and attitude towards writing can blur

my perception of how others view writing. Additionally, I want to see participants succeed and enjoy composing with Google Voice Typing, which may cause me to project my feelings and ideas on to them, influencing how they answer interview questions and how I interpret their answers. Being aware of my strengths and weaknesses throughout the study will keep them in check.