

**From Finger to Screen: A Phenomenological Inquiry into
Touchscreen Typing and Secondary Students**

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Abstract: As touchscreen technologies become ubiquitous in secondary school English classrooms, research on student writing practices needs to consider the impact of touchscreens on student writing processes and products. This is especially true as more End of Course cumulative assessments like ACT Aspire have students using and composing on iPads or other touchscreen technologies. The purpose of this mixed-methods phenomenological inquiry is to consider the impact of Apple iPads on the composing practices of secondary students in a rural mid-sized high school. The following IRB-approved study includes a survey of touchscreen use in academic and non-academic settings, a textual analysis of handwritten vs. touchscreen composed classroom writing, and a survey of six secondary students. The findings suggest touchscreens impact student writing in the areas of error correction and sentence length, and also reveal students composing on tablets have received little to no explicit instruction on using touchscreens and have had to rely on transfer from smaller touchscreen devices like cell phones to larger touchscreens. This reliance on transfer and lack of explicit instruction can result in modal ambiguity in student composing practices.

From Finger to Screen: A Phenomenological Inquiry into Touchscreen Typing and Secondary Students

The role and impact of touchscreen technologies in secondary composition classrooms has not been fully addressed in the existing research. Research conducted on the composing process of different keyboards (Kim, 2014), the use of tablets in university classrooms (Ahern-Dodson & Comer, 2013; Tualla, 2011), the occurrence of text-speak and informal writing in student composing practices (Klages and Clark, 2009; Palasz, 2012), and even the haptics of writing and their impact on cognition (Mangen & Velay, 2010) and student writing (Fow, 2013) do not fully address the impact of touchscreen technology on the composing process and products of secondary students.

Therefore, this study seeks to address the following research question and the following sub-questions: How does the use of touchscreen technology impact the composing processes and products of secondary students?

- a. How do touchscreens impact the way students compose personal communication?
- b. How do touchscreens impact the way students compose academic writing?
- c. Do instances of personal communication practices (text-speak and informal language) appear more often in academic writing composed on touchscreen technologies than handwritten pieces?

This research inquiry is a mixed-methods study with a primarily phenomenological methodology. The study includes a digital survey, semi-structured interviews, and the collection and comparison of handwritten and typed samples. Overall, the study finds modes of composition impacting student writing and has tangible implications for school administrators, teachers, and researchers. Finally, the research study was granted approval from the institution's IRB committee after a full review.

Review of the Literature

Kim's (2014) research, "Touch Typing Performance with Sensory Feedback on a Flat Keyboard," considers the differences between "finger typing on a flat keyboard (either an on-screen soft keyboard on a glass or a slim keyboard that serves as a touchscreen cover)" and a mechanical (more traditional) keyboard in hopes to "examine how visual, haptic, and auditory keyclick feedback affect typing performance" (p. vi). Kim's findings indicate "haptic keyclick feedback leads to the highest typing speed with the lowest total error rate among [the various] feedback conditions [in the study]" (2014, p. vi). However, Kim's research does not address the phenomenon of students typing using a flat keyboard, specifically regarding the types of errors associated with different input methods.

In a study conducted by Ahern-Dodson and Comer (2013), the researchers found undergraduate students preferred to take notes with a tablet (or perform smaller writing tasks) but found touchscreens frustrating when composing long-form essays (p. 75). Ahern-Dodson and Comer's findings concur with Tualla's (2011) findings in the study, "Mobile Engagement at Scottsdale Community College: The Apple iPad in an English Honors class." Tualla's findings indicate that students considered iPads helpful when writing notes with the Apple iPad Notes app but were frustrated when word processing using the MSWord app (2011, p. 48-49, 60). Tualla includes a brief comment about the frustration of typing on the iPad's touchscreen, but does not follow this line of inquiry.

In their article "New Worlds of Errors and Expectations: Basic Writers and Digital Assumptions," Klages and Clark (2009) found text-speak and informal language embedded in pieces of student writing composed with digital technologies. Klages and Clark attribute this phenomenon to their students' inability to "code-switch between informal cyber-situations and the more formal academic and professional expectations for cyber-literacy" (2009, p. 33). However, the appearance of text-speak and informal language is contested in Palasz's (2012) study, "Stdnt Wrtg in the Age of Txtspk: A Pilot Study of the Prevalence of Txtspk in Formal Student Writing." In the study, Palasz considers "how much students used technology, and [attempted] to gauge how much txtspk [students] allowed in [their] writing that is not appropriate because [the writing]

is a formal or academic document” (2012, p. 35). In the writing samples collected from 32 students, Palasz found “one true instance of txtspk” (2012, p. 42). A reason for Palasz’s finding may be the limitations of the study. Palasz had one written sample from the participants (32 out of the 60 overall participants), instead of multiple writing samples. Therefore, the results from the study are not triangulated in a way that provides validity. Additionally, Palasz’s study includes writing samples typed on a computer; therefore, the writing modalities of a written sample on a touchscreen, such as a tablet or a cellphone, are not under consideration in the study.

The Impact of Touchscreen Typing

Patronis’s (2014) study, “The Effect of Using the iPad on Students’ Performance in Writing and Reading Comprehension: Pilot Study Report,” intended to answer the following questions regarding writing on an iPad: “To what extent does the iPad aid students in their writing skills? Is there any evidence of improved writing accuracy whilst using the iPad (e.g. documented increase in grades)?” (p. 68). The study included participants who had used an iPad for two semesters before participating in the study, so the act of composing on an iPad was not a deterring factor in the results. The inquiry had students read and paraphrase a short excerpt using an iPad and writing by hand. The paraphrased writing samples were ten sentences in length and were scored according to a rubric. Then the results of the scores were compared. Out of the 77 students, 53% had “no significant difference with or without the iPad, 35% scored less with iPad [sic] due to ‘copy and paste’ occurrences, [and] 12% scored higher with iPad [sic]” (p. 71). While the study intended to examine the impact of iPads on student writing, the limitations of the study prohibit Patronis from providing any concrete findings. The primary limitation is the sample size, of which Patronis makes note.

However, additional limitations include the instruments and the method of the study. The seven survey questions include statements such as, “Using the iPad enabled me to check spelling, Using the iPad helped me write better sentences, [and] Using the iPad made it easier for me to write” (pp. 73-75). The written pieces “were graded according to standard a [sic] rubric, and the two (quantitative) test scores were obtained and

compared” (p. 69). The rubric included the following categories: “Punctuation, Sentence Structure, Comprehension, and Accuracy of Information,” each with a scale of 1-4 (p. 79). The rubric does not address issues such as spelling or the perception of improved writing, which the survey examines. Therefore, the study does not offer insight into the impact an iPad has on the writing processes of students, nor does the study address the associated modality of composing on an iPad and writing by hand.

Bridgewater’s (2014) study, “Writing in the Age of Mobile: Smartphone and Tablet Multiliteracies and their Impact for Writing as a Process,” is the closest study conducted that attempts to examine the writing processes of students using mobile and tablet devices. Bridgewater’s study includes First-Year Composition (FYC) students and sought to answer questions including: “What type of academic writing, research, and reading are first-year composition students doing on smartphones and tablets? How are smartphone and tablet academic writing, research, and reading practices mediated and situated? How do first-year composition students write for academic purposes differently on smartphones and tablets compared with desktops and laptops?” (p. 1). While this study does not examine the writing practices of secondary students, it is the closest study conducted regarding the presence of touchscreen typing in academic classrooms.

While Bridgewater’s (2014) study does not address the phenomenon of touchscreen typing, the study does provide insight into student use of smartphones and tablet technologies regarding academic writing, which Bridgewater claims has not been considered to a degree of generalizability. However, Bridgewater notes the limitations of the study. Bridgewater was hoping for a survey response size of 1,000, but only had 288

responses (2014, p. 46). Bridgewater notes the sample size “could be skewed by those students who have an interest in smartphones and tablets as opposed to those who are apathetic or do not own them” (2014, p. 47). Overall, Bridgewater considers academic writing on smartphones and tablets and does not examine the potential relationship between academic and personal writing processes.

iPads in Secondary Classrooms

Currently, research conducted regarding iPads in secondary classrooms examines the perceptions and use of iPads from teachers and students (Kim, 2014; Stewart, 2015; Wishard, 2015; Pettit, 2014; Vu, 2013; Alsufi, 2014; Beckerle, 2013; Messinger, 2011). Therefore, the studies do not attempt to address the impact of iPads on student composing practices and products and do not examine the phenomenon of touchscreen composition.

This review of the literature examines iPads in the classrooms from the perspectives of teachers and students, the impact of touchscreen typing on the speed and overall percentage of errors, the occurrence of text-speak in written pieces conducted by students, and the perspectives of teachers and students of iPads in secondary classrooms; however, existing research does not examine the phenomenon of using touchscreen technology to compose written pieces, nor does the research examine the potential for *modal ambiguity*¹ associated with using a mode of composition for academic purposes that resembles the personal communication practices of students. Therefore, the current study intends to examine the phenomenon of touchscreen typing, specifically the Apple iPad, and consider the impact this touchscreen technology has on student composing practices.

Bracketing

I was an 11th grade English teacher at a rural mid-sized high school with a 1:1 iPad initiative at the time of this study. The school has a majority population of minority students, and over 80% of students qualify for free or reduced lunch services. The participants in the study were my own students; therefore, through validation strategies and intentional bracketing, I had to ensure my presence and existing relationship with the participants did not explicitly impact the results of the study. I became interested in the impact of touchscreens on the composing practices of students when I noticed emojis, text-speak, and other occurrences in writing assignments for my class. However, I designed this study to try to ensure researcher bias was not a factor in the decision

¹ I define *modal ambiguity* as the impact different modes of composing can create in student writing practices, especially considering the transfer of composing practices from one mediated technology to another, i.e. -transferring typing practices and skills from a mechanical keyboard to a touchscreen keyboard, or using a touchscreen on a cellphone and using a touchscreen on a tablet device.

process, such as selecting particular students for the interviews or finding written texts with emojis to include with the written samples, which will be examined in depth in the methods and methodologies section of this paper.

Methodology and Methods

The purpose of this study is to examine the phenomenon and impact of composing using a touchscreen; therefore, the study uses a mixed-method approach to inquiry including phenomenological-based inquiry and quantitative data collection. The study includes a digital survey of 27 students, two writing samples from 10 students, and in-depth semi-structured interviews of 6 students in an attempt to triangulate data to better understand the phenomenon of touchscreen typing.

Survey

Students who assented along with the consent of a parent or guardian to participate in the survey portion of the study took a “Touchscreen Survey” on Google Forms, which collected and stored the data. The survey included background information about the students, information about touchscreen typing, types of writing

conducted on touchscreen technologies, and provided a general overview of student perceptions about iPads in the classroom.

Semi-Structured Interview

Students who assented along with the consent of a parent or guardian to participate in the interview had owned a mobile phone with a touchscreen keyboard for at least three years, and had been assigned an Apple iPad from the school district were eligible to participate in the interview. Participants were selected based on availability and willingness to participate. The interview sought to understand the nuanced writing processes, preferences, and mindsets of secondary student writers using an iPad touchscreen, a cellphone touchscreen, and either a pen or pencil (handwritten). Interviews were audio-recorded and then transcribed. To ensure validity, participants were presented with the transcripts and allowed to edit the transcript to either provide

clarity or delete portions of the interview. Participants had to initial the transcript to provide consent for the transcript's use in the study.

Writing Comparison

Finally, two classroom writing samples were collected from 10 secondary students who assented to be included in the study alongside parental consent: one sample was handwritten and one sample was typed using an iPad touchscreen. The written samples were collected from the pool of assenting students who had maintained a “B” average during a former marking period to ensure an equitable standard of academic achievement. I selected “B” average students because these students have demonstrated their understanding of academic writing conventions and were closer to an average of secondary writers at the research site. The writing samples were coded to protect student information and were analyzed for writing errors. The purpose of the writing comparison was to examine whether informal text-speak was more prevalent using a touchscreen compared to handwritten texts. The content in the writing samples was not analyzed, only the amount and types of errors present in the writing samples were counted and compared.

Results

Surveys

Twenty-seven participants completed the survey. Out of the 27 participants, 25 participants (92.5%) owned a cellphone, but all the participants who owned a cellphone had a touchscreen on their cellphone. Twenty-seven participants (100%) were assigned an iPad from the school district. Twenty-two participants (88%) had owned a cellphone with a touchscreen for more than two years, while 14 participants (56%) had owned a cellphone with a touchscreen for more than three years. Regarding touchscreen technology and their role in school, 23 participants (92%) who owned a cellphone used that cellphone for school purposes at least weekly (see Fig. 1), and 22 participants (88.9%) used their iPads for school purposes at least weekly (see Fig. 2).

How often do you use your cellphone for school purposes?

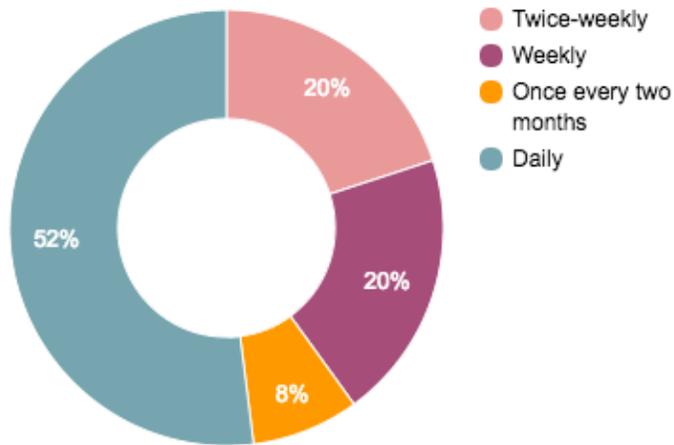


Figure 1: Survey Results about Cellphone Use for School Purposes

How often do you use your iPad for school assignments/activities?

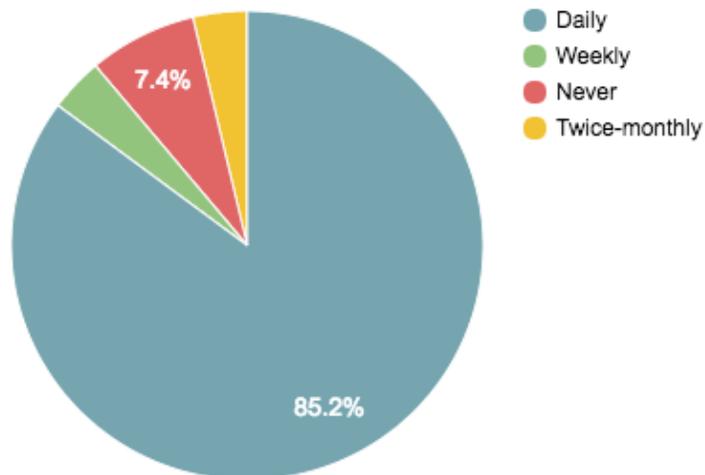


Figure 2: Survey Results about iPad Use for School Purposes

In terms of composing practices on cellphones and iPads, students primarily composed writing on cellphones for social functions. Twenty-four participants (96%) used their cellphone to text friends, 23 participants (92%) used their cellphone to text family, and 22 participants (88%) used their cellphone to post on various social media outlets including Facebook, Twitter, and Snapchat. Additionally, 18 participants (72%) used their cellphone for academic purposes to search for information for school, 19 participants (76%) used their cellphone to take notes or create reminders, and 9 participants (36%) used their cellphone to type school assignments (see Fig. 3).

In terms of composing practices on an iPad, students primarily composed writing on iPads for academic functions. Twenty-four participants (88.9%) used iPads to email teachers, type school assignments, and search for information. Additionally, 17 participants (83%) used their iPad to type notes or create reminders (see Fig. 4).

What kinds of writing do you do on your cell phone? (Select all that apply.)
(25 responses)

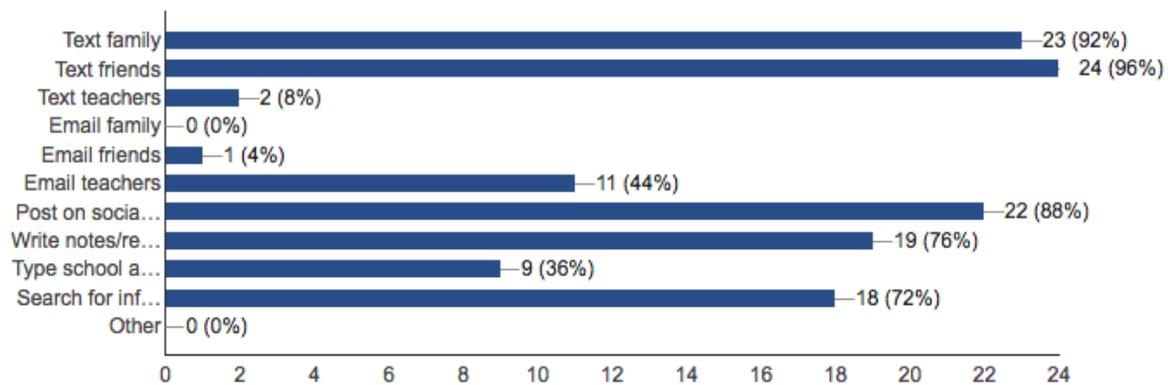


Figure 3: Survey Results about Types of Writing Composed on Cellphones

What kinds of writing do you do on your iPad? (Select all that apply.)

(27 responses)

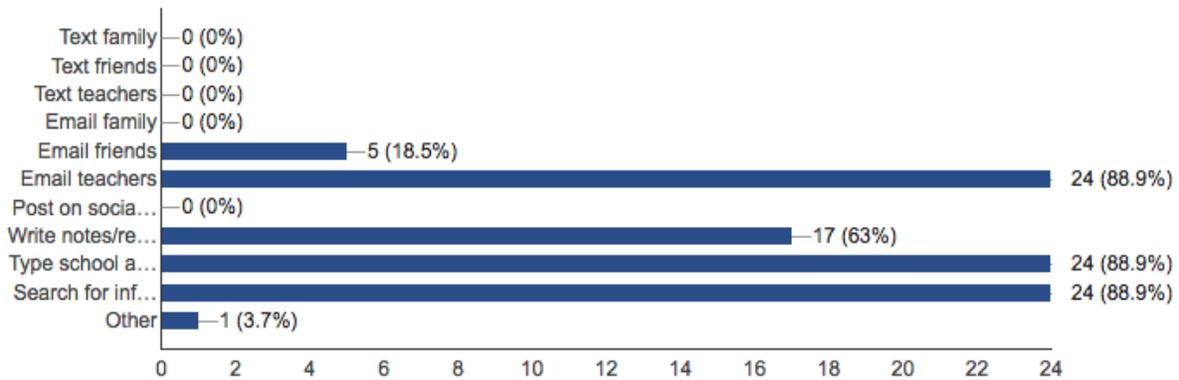


Figure 4: Survey Results about Types of Writing Composed on iPads

Regarding regular iPad use in the classroom, 27 participants (100%) used an iPad regularly in their English class, 14 participants (51.9%) used an iPad regularly in their Math and History classes, 10 participants (27%) used an iPad regularly in their Career and Technical Classes–Non-Tech Focus classes including Medical Professions, Sports Medicine, Family, and Consumer Sciences. 7 participants (25.9%) used an iPad regularly in their Science classes, 6 participants (22.2%) used an iPad in their Career and Technical Classes–Technology Focused such as EAST, Digital Communications, and Business Communication classes (although this may be due to access to computers and other technology in those classrooms), and Band/Choir, Art, and Sports had minimal use of consistent iPad use in their classes (see Fig. 5).

Which classes regularly use the iPad as part of classroom instruction? Select all that apply. (College courses can be included in the academic discipline. For example, Comp 1 would be classified under English.)

(27 responses)

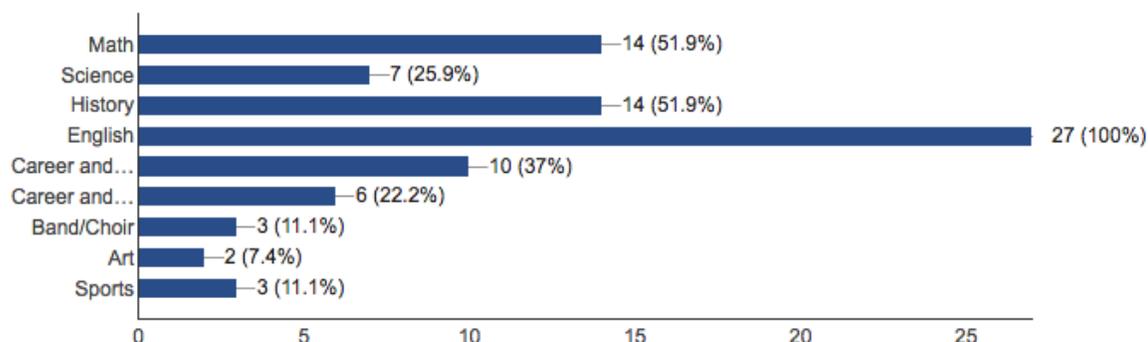


Figure 5: Classes that Regularly Use iPads as a Part of Instruction

Finally, 15 participants (55.6%) preferred to use an external keyboard instead of an iPad touchscreen, while 12 participants (44.4%) preferred to use an iPad touchscreen as opposed to an external keyboard. 17 participants (63%) preferred to use technology as opposed to handwriting an assignment, and 10 participants (37%) preferred to handwrite assignments opposed to typing assignments with technology. Overall, 22 participants (81.5%) consider iPads to be helpful, while 23 participants (85.2%) thought the school should keep assigning iPads to students.

Interviews

The interviews were semi-structured and were on average a length of 15 minutes (see Appendix A for the interview questions). After transcribing the interviews and conducting member checking, the interviews were then analyzed for significant statements. These statements were then collected and sorted into six broad themes (see Appendix B for a brief collection of statements and themes).

Theme #1: Identification as a writer. The participants were asked whether or not they identified as writers, and three writers identified as writers, two participants somewhat identified as writers, and one participant did not consider himself to be a

writer. Jeff, the only participant who did not identify as a writer commented he did not like writing “because it’s boring.” The participants who identified as writers noted their ability to write stories. These stories could be made up or works of fiction, but only one participant, Jada, commented further: “I’ve always liked to write. I’ve always been capable of writing and been able to let people understand what I’m writing. I want people to be able to read my stuff clearly...I do narratives, mostly. I’m really good at descriptive writing, I’ve been told that. And [I write] explanatory [texts].”

Theme #2: Audience awareness. All six participants referenced audience awareness in their comments about the difference between typing on an iPad and typing on a cellphone. John mentioned he wrote differently for school because it was “for a grade.” Jada said, “I give more information with different [types of writing], especially for school work. I want to make sure I get in every single detail I possibly could so I can give, get the best grade I can possibly get.” Lisa commented, “On my phone I use slang. When I use an iPad, I don’t because I want to get a good grade....When I’m on an iPad, I have to think about what I want to do later, or how what I write is going to affect me in some way.” Additionally, Jeremiah said he focused on his typing and handwriting because “I have to turn stuff in for a grade.” Finally, Jeff mentioned, “If I’m writing something down [for school], I’m not going to be like ‘lol’ or something. I use complete sentences and stuff.”

However, audience awareness was not just limited to academic situations. When referring to typing on his cellphone, Jeremiah said, “I just type however way I want to. Because I really don’t...people know what I’m talking about.” Jada mentioned texts and emails: “A text or an email might not be as relevant, so I don’t have to completely explain the whole entire situation.” Lisa mentioned when she is on her phone, “I’m more, not out there, but I can be myself on there.” John mentioned when texting, “I’ll tend to take a lot of shortcuts, like you know, not spell each word correctly.” The participants were cognizant of their audience and made rhetorical choices based on this recognition of audience. Finally, two of the participants, Jeremiah and Star, had disabled the autocorrect feature on their phones but had kept the autocorrect feature on their iPads. In defense of disabling his autocorrect on his cellphone, Jeremiah said,

“People will know what I mean” and that he had not turned his autocorrect off his iPad because the work on his iPad will “be turned in for a grade.”

Theme #3: Learning to type. All of the participants had been in the school district since at least Kindergarten; therefore, I assumed each participant would provide the same answer when asked, “How did you learn how to type?” Three participants mentioned a “7th-grade typing class,” two participants mentioned an “8th-grade typing class,” and one participant mentioned a “7th and 8th-grade typing class.” Star mentioned every student had to take the typing class both years in middle school; however, the other participants did not mention two years of typing class and were split between which year they took the typing class (although every participant mentioned taking a typing class in middle school).

Theme #4: Texting vs. typing. All six participants had taught themselves how to type on a cellphone and then transferred that knowledge to typing on an iPad. Jeff said, “I had to figure out where the letters were [on a cellphone],” and that typing on an iPad was “the same as typing on a phone. It’s common sense.” Lisa and Jada both mentioned the size of an iPad being larger than their cellphones, but both participants commented the transition to typing on an iPad was easy after figuring out how to type on a larger device. One participant, Star, mentioned she taught herself to type on a “flip-phone” keyboard and originally typed with one thumb, but switched to two thumbs once she got a cell phone with a touchscreen.

The participants had different methods for typing on an iPad. John used either his two thumbs or two index fingers because “it’s the fastest way to type.” Jada used all ten fingers because she “can type at a faster pace.” Jeremiah used his fingers but not his thumbs because it’s “faster that way.” Star used her pointer and middle fingers on both hands because “it’s faster.” Jeff used his thumbs “because that’s how [his] phone is.” And Lisa used her two thumbs when the iPad was vertical and all her fingers when the iPad was horizontal because “it’s too far to reach” with her thumbs when the iPad is horizontal. Five of the participants typed the way they did on an iPad due to speed or

ease, and one participant typed on an iPad the way he typed on a cellphone, but did not mention speed or ease; although, ease of transfer may be applicable in this instance.

Theme #5: Keyboard vs. touchscreen. When asked whether the participants preferred using an external keyboard or the touchscreen to type on an iPad, four participants preferred an external keyboard, one participant preferred an external keyboard if he did not have to carry the external keyboard due to its bulk, and one participant outright preferred the touchscreen to an external keyboard.

Theme #6: Perception of errors. Finally, the participants were asked whether they thought they made more writing errors on an iPad, a cellphone, or by hand. Four participants commented they thought they made more writing errors by hand, and of these four participants, three mentioned the iPad's autocorrect feature. In contrast to these statements, Jada mentioned she made more errors on an iPad because of the autocorrect feature. Finally, Jeff mentioned he thought he made more errors on a cellphone "cuz you're used to texting folks instead of writing. Misspell words and all that. When you was writing it on paper, you wouldn't be doing all that."

Outlying Themes. Jeff said he preferred writing by hand because writing on a cellphone or an iPad would tempt him to cheat for school assignments:

J: The big difference is if you got a touchscreen and you're writing something, you're going to cheat. That's it. Regardless. Paper. Not so much.

PI: Why do you think that is?

J: Because it's always, you can open another tab one click away, go straight to Google, and get all the answers. You on paper, and you in your room, you ain't got nothing, you just going off the head.

Additionally, Star and Jada both mentioned that they do not like typing on an iPad overall. Star said, "I don't really like typing on an iPad. It's hard." Star and Jeff mentioned handwriting a rough draft before typing the assignment on an iPad because this was how they were taught by previous teachers to write assignments for school. Finally, John mentioned short versus long text: "On my iPad, if I tend to type with my

fingers, it will tend to be shorter, but if I type with a keyboard or something, it will be longer.”

Written Samples

After collecting the written samples, each sample was reviewed three times. The samples were analyzed for errors indicated by the ACT Aspire End of Course assessments, including spelling, mechanics (including punctuation error and spacing issues), capitalization, word omission, word choice error, ambiguous wording (including pronoun reference and word choice that was not marked word choice error), and my addition of the inclusion of casual text (including text speak or informal language). The results were tallied and collected into a spreadsheet. Finally, due to a comment made by John in the survey about “writing long text” on a keyboard versus a touchscreen, I counted the number of sentences and words per sentence in the written samples to find an average word per sentence. The numbers of errors and average words per sentence from all ten handwritten and typed (referred to as “Digital” in the results) samples were counted and then compared (see Fig. 6 and Fig. 7). Collectively, the handwritten samples produced a higher rate of capitalization and word omission errors, while the typed products produced a higher rate of spelling, mechanics, word choice errors, and occurrence of casual text.

	Handwritten	Digital	Difference
Average Words Per Sentence	14.34	10.658	-3.682
Spelling Errors	18	69	+51

Mechanics	33	49	+16
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Figure 6: Written Text Comparisons, pt. 1

	Handwritten	Digital	Difference
Capitalization	23	20	-3
Word Choice	12	27	+15
Casual Text*	0	4	+4

* Casual text included: “kinda, lots, back then, still a thing”

Figure 7: Written Text Comparisons, pt. 2

Limitations

The participants in the survey were my students; therefore, the data collected from the surveys may have looked different if the primary researcher was not me.

Additionally, because this was a preliminary investigation, the amount of participants in

the survey is not a broad selection of students and does not lend itself to generalizability. The writing samples were collected from 10 students with a “B” average; however, future inquiries should include a broader selection of students with various grade averages.

Finally, the 6 interviews were not as in-depth as I would have hoped, primarily because I

did not want to influence answers or ask leading questions. It is my opinion that if the participants had not been my students, I would have asked further follow-up questions and would have pushed the participants to answer with more depth. While I did attempt to alleviate any researcher bias, the fact that the participants were my students may have influenced the results of the study, specifically the interviews.

Discussion

The findings of this study were both surprising and enlightening. I did not see any blatant occurrence of text-speak in the written samples, however, this may be due to the level of preparedness from “B” average students. Additionally, the findings from the survey did not match the findings from the interviews. Overall, 15 survey participants (55.6%) preferred to use an external keyboard as opposed to a touchscreen, while 5 of the 6 survey participants preferred to use an external keyboard. The overall perception of technology in the classroom was fairly positive with 22 survey participants (81.5%) considering iPads to be helpful in the classroom, but one survey participant selected “Hurting” when asked about whether iPads were helping or hurting students in the classroom, and still selected “Yes” when asked, “Should the school keep assigning iPads to students?”

Participants in the study were taught how to type on a QWERTY-keyboard through school-mandated typing classes; however, every interview participant mentioned being self-taught when explaining how they learned to type on an iPad. Therefore, the introduction and inclusion of iPads in the classroom is not being mediated by school programs, unless individual teachers take the time to help navigate the use of iPads in their respective classrooms. The participants did not mention teachers instructing the participants with regards to typing on an iPad. Therefore, the

overall perception appears to be that students know how to type on a QWERTY keyboard, which will naturally transfer to an iPad touchscreen due to the layout of the QWERTY keyboard on an iPad. However, the participants mentioned transfer from cellphone touchscreens to iPad touchscreens, not transfer from a keyboarding class to typing on an iPad.

The interview participants were cognizant of audience and made rhetorical decisions based on the intended audience; however, as demonstrated in the written samples, audience awareness does not decrease the amount of errors produced in either handwritten or touchscreen typed text. Additionally, this awareness of audience translated into the types of writing composed on the touchscreen devices. Survey participants indicated a primarily social use for cell phones, and a primarily academic use for iPads. This may be because the school district assigned the iPads to the students or may even be connected to the school district's restriction of social media applications on the iPad and blocking of social media websites on the school internet.

The study shows a correlation between the mode of composition and the occurrence of errors. Despite interview participant perceptions, there were more written errors on iPads than handwritten samples. The perception that the iPad's autocorrect feature would prevent participants from making spelling and grammar errors does not align with the results of the written samples. Additionally, one of the findings from this research is that mode of composition impacts the written products of the participants. While the findings do not provide insight into the process of writing on touchscreen texts, with the exception of two participants who handwrite drafts before typing them, the fact that the modes of composition impact the product should not discount further inquiry into the impact of touchscreen technology on the writing processes of secondary students.

The biggest surprise was the insight into a decrease of average words per sentence on an iPad compared to handwritten samples. This was not an intended area of discovery; however, the insights into the impact of touchscreen technology and the products of secondary students are helpful in considering implications for school administrators, teachers, and researchers.

Implications for School Administrators, Teachers, and Researchers

As technology initiatives including 1:1 iPad initiatives and "Bring Your Own Device" (BYOD) programs are implemented in school districts nationwide, the modes and methods of composition must be examined without the assumption that students

will know how to navigate these tools. Furthermore, many students have been required to take the PARCC End of Course assessment or ACT Aspire End of Course Exam on iPads. Therefore, as students are being held accountable for the written texts produced on iPads for these End of Course assessments, school administrators and teachers must be aware of the impact of touchscreen technology on student composing practices, specifically the reduction in average word per sentence and the higher occurrence of errors in products composed on iPads. Even with an external keyboard, PARCC and ACT Aspire's testing program, TestNav, does not include autocorrect. Therefore, if students rely on autocorrect software when composing texts on iPads for their daily assignments, there is potential for students to not scrutinize their work for written errors when produced for these End of Course assessments. Finally, the examination of touchscreen technology on student composing practices should not be limited to secondary classrooms. Technology initiatives are starting in Kindergarten classrooms and extend to post-secondary education; therefore, the methods and modes of composition need to be considered through the entire spectrum of education.

Teachers employed in school districts with technology initiatives should be aware of the impact these technologies have on student writing, specifically in assuming natural transfer between typing on a QWERTY keyboard or student cellphone use. The assumption that students will naturally transfer their typing skills to an iPad can be harmful. Additionally, assuming students are familiar with technology and conducting large portions of classroom activities on an iPad can lead to unintended consequences for student writers. If the modes of composition create dependence on autocorrect

features and decrease the number of words per sentence, there may be lasting consequences for student writers on End of Course examinations and for classroom writing assignments. Finally, Jeff's comment about plagiarism is also important in this context. If students are prone to plagiarism and cheating on iPads, unmediated access to technology, or unmediated instruction using iPads, may be detrimental to the learning process of students and may increase the occurrence of plagiarism in academic assignments.

Additional research, from both teachers and academics, needs to be conducted from a student perspective, not only a teacher preparation perspective. While it may be helpful to conduct research to prepare future teachers to implement iPads in a classroom, not understanding the impact of touchscreen technologies from a student's perspective will create a blind spot for educators and researchers. Additionally, longitudinal research regarding touchscreen technology and student composition practices may be helpful in navigating the inclusion of iPads and other tablet or cellphone touchscreen technologies in the classroom.

Finally, further research is needed regarding modal ambiguity. The concept and occurrence of modal ambiguity needs to be further defined and considered, not only regarding the method of input, but also the site of input. As education programs and tools are designed to resemble social media sites, there is potential for modal ambiguity to be present. Overall, school administrators, teachers, and researchers need to understand how modes of composition and spaces of composition, both physical and virtual, impact the processes and products of student composition at all levels of education.

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Appendix A: Interview Questions

Introduction

What grade are you in?
How long have you been at Hope High School?
How long have you been in Hope Public Schools?
Have you been assigned an iPad from Hope High School?
How many years have you had an iPad at Hope High School?
Do you consider yourself to be a writer? Why or why not?

Types of Writing

What kinds of writing do you do with your cellphone?
What kinds of writing do you do on your iPad?
What kinds of writing do you do by hand?
How are all three of these different?
How does the method with which you write (iPad, cellphone, or by hand) impact what you write, how you write, and why you write?

Process

What is your experience typing on an iPad or a touchscreen? What do you mean by that?
What does writing on the iPad look like for you?
What does writing for school assignments on the iPad look like for you?
How does your writing process differ for writing on your cell phone and on your iPad?
How does your writing process differ for writing on your iPad and writing by hand?
What is the difference in your writing process when you write on your iPad, on your cellphone, or by hand?

Learning to Type

How did you learn how to type on your cell phone?
How did you learn to type with a QWERTY style keyboard?
How did you learn how to type on an iPad?
How do you type on an iPad? Do you use two fingers, your thumbs, or all five fingers?
Why do you do this?

Preferences

Do you prefer to use an iPad touch screen to type or an external keyboard when using an iPad? Why is that?
Do you think you write better with an iPad, your cell phone, or by hand? What do you mean by that?
Do you think you make more writing errors on an iPad, a cellphone, or writing by hand? Why do you think that is?

There is room for follow-up questions as the conversation permits or dictates.

Appendix B: Collection of Quotes, Statements, and Themes from Interviews

Identification as a Writer	Audience Awareness	Learning to Type
<p>“Yeah, a little bit.” “Yes. Definitely.” “Yes. I can write whatever comes to mind, I can just write it and turn it into a story.” “Sometimes I can write good and sometimes I can't.” “No. Not at all. It's boring.” “Kind of. I can write about some things, not everything. I can make stories up...I don't like writing prompts.”</p>	<p>Text message: "I'll tend to take a lot of shortcuts, like you know not spell each word correctly...iPad I'll tend to correct them. Spell it out more. Explain it a bit more." "For school."</p> <p>"I give more information with different ones....especially for school work. I want to amkes ure I get in every single detail I possibly could so I can give, get the best grade I can possibly get....a text or an email might not be as relevant, so I don't have to completely explain the whole entire situation.</p> <p>Phone: "I just type however way I want to. Because I really don't...people know what I'm talking about." iPad: "Regular because I sometimes I have to turn stuff in for a grade." Hand: "I do regular too. To get a passing grade."</p> <p>Make it long "because we're not really supposed to use short text." Audience awareness. School work. At home writing on iPad doesn't change. Research, essays, notes, Cornell notes, and that's it.</p> <p>Cellphone is mainly twitter or something. iPad is for school.</p> <p>"When I use my phone, I'm more free. When I use my iPad it's more, not stricter, but more educational." On "phone I use slang. When I use an iPad, I</p>	<p>How did you learn how to type on a QWERTY keyboard? 7th grade typing class</p> <p>Typing class, "8th grade I believe." 7th grade keyboarding class. 8th grade, teacher taught him in computer lab. 7th and 8th grade typing classes. Used to type with one hand (one finger), then took a year to get to two hands. Got hard when it got faster. 7th grade keyboarding class.</p> <p>How did you learn how to text? “Taught myself...I’ve been around it since I was 5.”</p> <p>“I taught myself.”</p> <p>Self-taught.</p> <p>Self-taught. Flip up phone, one thumb, then touchscreen, two thumbs.</p> <p>Self-taught. Figure out where the letters are.</p> <p>Watched other people, then taught herself.</p>

	don't...Because I want to get a good grade." By hand there can be mistakes because she writes "too fast."	
Texting Vs. Typing	Keyboard Vs. Touchscreen	Perception of Errors
<p>Typing is more "ghetto it's like streets." If I'm writing something down I'm not going to be like 'lol' or something. Complete sentences and stuff."</p> <p>How did you learn how to type on an iPad? "[Typing on an iPad] was the same thing as a phone. Common sense."</p> <p>Self taught. Around it since she was 5.</p> <p>Not really a problem since "I got adjusted to the different screen size"</p> <p>Taught himself.</p> <p>Same as my phone. It was just bigger.</p> <p>How do you type on an iPad? "Either my thumbs, or either two fingers, two index fingers." It's fastest way to type "Cuz I'm used to my phone like that."</p> <p>Use all 10 fingers "I find it easier...I can type at a faster pace" "I use everything but my thumbs." Faster that way.</p>	<p>"Text will be a bit quicker or faster to get the point out. Then by essay it will be more explained thoroughly, more formal. Then the iPad is more like just to get it done." "On my iPad, if I tend to type with my fingers, it will tend to be shorter but if I type with a keyboard or something it will be longer."</p> <p>External keyboard, unless he has to carry it around with him.</p> <p>"For long essays, I really prefer to use a keyboard." More control.</p> <p>"Touchscreen is faster. I Got fast by being on my phone all the time."</p> <p>"Keyboard is faster."</p> <p>"Keyboard is easier."</p> <p>"Keyboard is faster than tapping."</p>	<p>Hand: "make sure everything is spelled correctly, and everything's good." Sloppy handwriting.</p> <p>More writing errors by hand or by phone. "iPad, it has autocorrect and everything. Punctuation." "Phone, I'd tend to take shortcuts, and not make the writing as long as I would or typing it."</p> <p>Cellphone: "Not as full words like in a text or on an iPad, as in smaller words like 'brb' or just smaller words." iPad. "[I] could be saying a word and it's an actual word, but to technology it'll autocorrect to something completely different to what <i>it</i> knows."</p> <p>Writing by hand "I can make mistakes that I won't know I made, and I can turn it in and get points taken off. iPad lets me know if there's a mistake."</p> <p>Cellphone: "Cuz you're used to texting folks</p>

<p>Uses both pointers and middle fingers because it's faster.</p> <p>Two thumbs. "Cuz how my phone's position in my hands, my thumbs are right there and it's easy."</p> <p>Vertical: thumbs. Horizontal: all of the fingers.</p>		<p>instead of writing. Misspell words and all that. When you was writing it on paper you wouldn't be doing all that."</p> <p>"The big difference is if you got a touchscreen and you're writing something, you're going to cheat. That's it. Regardless. Paper. Not so much."</p> <p>Makes more mistakes by hand "Because the phone and iPad have where it corrects you, like your spelling, grammar, punctuation, and everything."</p>
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