



# Essay Composition across Media: A Quantitative Comparison of 8th Grade Student Essays Composed with Paper vs. Chromebooks<sup>☆</sup>

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## Abstract

Many current standardized testing and teaching practices approach media for composition with the assumption that media do not influence the writing process in significant ways. This study seeks to determine whether emergent media used for student writing influence essay composition (in terms of quantifiable text indicators) and compares a set of eighth-grade student essays composed via Chromebooks ( $n = 139$ ) to those written by hand ( $n = 319$ ). Essays were collected from students across three (3) schools, and descriptive results corroborate previous findings that Chromebook essays were generally longer than handwritten essays. ANOVA hypothesis testing on Flesch-Kincaid reading ease and grade level scores yielded new knowledge with regard to writing complexity as they indicated that Chromebook essays exhibited a significantly higher grade-level of writing and greater reading difficulty. This suggests greater complexity in word usage and sentence composition among Chromebook essays when compared to handwritten essays and also suggests that the medium itself may have an effect upon the complexity of student writing.

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## 1. Introduction

Societal demands for technology competencies and standardized testing in K-12 schools are now requiring students to learn basic keyboarding and word processing skills at a younger age. In some states, students might be required to complete an online, computer-based assessment for a keyboarding-intensive subject such as writing as early as the third grade (Idaho SDE, n.d.). Thought leaders in media studies have long considered the role that communication technologies (or media) play on the interactions and experiences that occur through them (McLuhan, 1994), and scholars of writing have similarly considered how composing through various media may influence or even fundamentally alter the writing process (Brandt, 2014; Haas, 1995). Research specific to characteristics of essay writing via keyboard versus composing with pencil seems to have peaked in the late 1980's and early 1990's, as computers became more

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prevalent and available for ubiquitous home use. As a result, while there has been recent research on specific aspects of writing like composing on keyboard versus touch screen (Davis, Orr, Kong, & Lin, 2014), typing versus handwriting speed (Horne, Ferrier, Singleton, & Read, 2011), and using computers to score student essay writing (Berrett, 2013; Bousquet, 2012; Hadi-Tabassum, 2014), little research has been done in recent years to determine whether essay writing in an online medium differs from writing in a more traditional medium according to objective, quantifiable measures.

As more school districts are moving to computer-based writing assessments, it is increasingly important for teachers of writing and technology to learn how to best prepare and support students to demonstrate their writing ability, regardless of medium. Toward this end, this research study seeks to answer the following question: *How does the writing medium (handwriting vs. browser-based word processing) influence objective quantitative components of middle school student essay complexity (e.g., Flesch-Kincaid scores) and adherence to conventions (e.g., capitalization and spelling errors), and what are the pedagogical implications for teachers of writing?*

### 1.1. Writing Process

Some studies indicate that students write more, revise more, and enjoy writing more when completing writing assessments done on a computer, rather than paper and pencil, and therefore perform better on writing assessments on a computer (Dalton, Hannafin, & Hooper, 1989; Pennington, 1993). It has been acknowledged that the traditionally-taught writing process: Prewriting, Drafting, Revising, Editing, Publishing (Elbow, 1998) as well as the cognitive processes needed to do it can look different when students are composing on computer versus on paper (Way, Davis, & Strain-Seymour, 2008). When composing on paper, for example, students may spend more time in the Prewriting stage, generating thoughts and organizational strategies, so the paper can be penned as close to a final draft version as possible, given the time demands and challenges in revising on paper. Conversely, students composing with a computer tend to spend less time on the prewriting stage and more time in the revision stage (Chadwick & Bruce, 1989; Haas, 1995; Muldrow, 1986; Russell & Haney, 2000), and when students do revise, there are significant increases in both the number of modifications and quality of revisions (Chadwick & Bruce, 1989; McAllister & Louth, 1988). Using a word processor, it seems, allows students some freedom and flexibility in the ways in which they flow in and out of the stages of the writing process (Haas, 1995; Pennington, 1993; Poulson, 1991).

### 1.2. Quality of Writing

It is in the area of quality of writing (including aspects such as complexity of language, essay length, and grammar) that the research has the most conflicting results. For example, several studies have found no difference in quality of writing between essays written on paper and computer (Etchison, 1989; Grejda & Hannafin, 1992; Hawisher, 1987; Hawisher & Fortune, 1989; Kurth, 1987; Nichols, 1996). Conversely, some studies found improved quality in those essays composed on the computer (Haas & Hayes, 1986; Owston, 1991; Phenix & Hannan, 1984). Moreover, the earliest meta-analysis (Bangert-Drowns, 1993) found a small effect size for quality of writing (.27) across studies with elementary, secondary, and college students, but a more recent review (Goldberg, Russell, & Cook, 2003) found a larger effect size for quality (.41). Robert L. Bangert-Drowns's (1993) meta-analysis reported that the largest improvements in the quality of writing are found for students with learning disabilities, elementary aged students, students performing below grade level, and college-aged students, leaving middle and high school students with the lowest amount of improvement in quality of writing while using a word processor. Some studies also show that there are positive effects on the quality of composition with larger effects for students who are low achieving (MacArthur, 2009; Robinson-Stavely & Cooper, 1990). A meta-analysis of 19 studies limited to fourth through twelfth grades (Graham & Perin, 2007) found an effect size of .51 for writers in general but a larger effect size of .70 for writers who are low achieving (overall effect size of .55) (MacArthur, 2009). However, Jennifer N. Burke and Gregory J. Cizek (2006) found that, regardless of skills or confidence with technology, sixth graders produced better essays by hand than they did when typing (in terms of mechanics, organization, development, structure, support, and word choice).

The specific device through which students type can be another factor in student success. When students are asked to complete writing tasks via iPads, their typing is slower and less accurate, and students struggle to copy and paste text (Pisacreta, 2013). Screen size when using tablets also becomes an issue as students have a difficult time testing on smaller devices compared to larger devices, especially when taking a longer test (Davis et al., 2014), though this same pattern may not carryover to different sizes of laptops (Keng, Kong, & Bleil, 2011). Regardless of the size, external

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