

Contents lists available at [ScienceDirect](#)

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

Touch typing instruction: Elementary teachers' beliefs and practices

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ARTICLE INFO

Article history:

Received 21 February 2016
 Received in revised form 25 June 2016
 Accepted 27 June 2016
 Available online 29 June 2016

Keywords:

Elementary education
 Pedagogical issues

ABSTRACT

Writers have a limited number of cognitive resources to allocate to the task. Consequently, searching for keyboard letters restricts them from fully engaging in the writing process. High expectations for writing across all levels of education suggest the need for touch typing skills. This mixed methods study examined the beliefs and practices of elementary teachers related to teaching students touch typing skills. Participants included third through sixth grade teachers from eight California counties. A survey completed by 268 teachers was followed by interviews with 12 participants. Results indicated teachers felt touch typing skills were important and that a lack of touch typing proficiency would negatively impact student performance on standardized tests. Teacher perceptions of the impact of student touch typing skills on their writing was divided. Few respondents indicated they or other school personnel offered touch typing instruction. Discussion centers on how these findings were likely influenced by amount of time for instruction, general beliefs about writing instruction, student access to technology, and teacher awareness of how touch typing skills may influence the writing process. Implications for practice are offered.

Published by Elsevier Ltd.

1. Introduction

Despite limited student access to computers in schools in the late 1980s and early 1990s, a multitude of studies were conducted during that era to examine the impact of word processors on writing. Results generally demonstrated an advantage for word processors over writing by hand with regard to number of words written, number of edits made, and quality of writing (Daiute, 1986; Goldberg, Russell, & Cook, 2003; Hunter, Jardine, Rilstone, & Weisgerber, 1990; Wolfe, Bolton, Feltoovich, & Welch, 1993). Other studies found no improvement in writing quality without sufficient instruction in writing or proficiency with the word processor itself (Bangert-Drowns, 1993; Cochran-Smith, 1991; Hunter et al., 1990; Joram, Woodruff, Lindsay, & Bryson, 1990). Christensen (2004) found a positive relationship between keyboarding fluency and writing quality, with use of the word processor actually decreasing writing quality if students could not enter text efficiently. The ability to efficiently touch type—typing without looking at the keyboard—allows writers to free up cognitive resources for the writing task. It has been suggested that writers need the same level of automaticity with a keyboard that they do with handwritten text in order for word processors to provide an advantage in writing quality (Christensen, 2004; Connelly, Gee, & Walsh, 2007).

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1.1. Cognitive load, working memory, and transcription

Cognitive Load Theory espouses that learners are capable of attending to a limited number of cognitive tasks at any given time, restricting their capacity to process additional information (Paas & Ayres, 2014; Paas, Renkl, & Sweller, 2004). The theory explains how learners transfer new information, skills, and processes from working memory into long term memory. Cognitive Load Theory applies to the writing process according to Berninger et al. (2002), who purport working memory plays a pivotal role in written compositions. Fig. 1 shows the simple model of writing developed by Berninger et al. (2002). In the model, transcription is the process of generating the letters that form words. Executive functions are strategies writers use in planning their work. These strategies are taught and modeled by teachers in the early stages of writing instruction. Transcription and executive functions form the base of a triangle, tasks drawing upon working memory which appears at the center of the triangle. As such, writers who have deficits in transcription skills cannot allocate sufficient working memory resources to the overall writing task because they, instead, have to use their working memory to formulate letters and words. Writers who are adept at transcription have the potential to use more of their cognitive resources on executive functions and higher-level composition skills at the top of the model's triangle. Research indicates those who have to engage working memory to generate letters and words have less capacity to concentrate on the process of writing regardless of whether text is generated via paper and pencil or keyboard (Berninger, 2000; Bourdin & Fayol, 1994; Connelly et al., 2007; Hayes & Chenoweth, 2006; Olive, Favart, Beauvais, & Beauvais, 2009). It is also likely that skilled use of word processing functions contributes to the quality of writing (Grabowski, 2008).

1.2. Use of digital devices for writing

The number of computers and related devices in schools has increased substantially in recent years, with the ratio of students to internet-ready devices improving from 6.6 to 1 in 2000 to 3.1 to 1 in 2008 (National Center for Education Statistics, 2010) and continuing the trend. Since the new millennium, word processing has been one of the most prevalent uses of computers in schools across all grade levels and subject areas (Becker, 2000; Goldberg et al., 2003) suggesting that the use of the keyboard has increasingly become a mode of text entry in writing tasks. The potential for a much faster transcription rate via keyboard than via pencil and paper provides intriguing possibilities for writing quality if touch typing skills are systematically taught in schools the way handwriting has been a staple within the educational system. Touch typing automaticity combined with a systematic and rigorous writing curriculum can help students become proficient writers.

While the adoption of the Common Core State Standards (CCSS) has been contentious across the United States, few would argue about the importance of developing skilled writers starting at the elementary level and increasing in sophistication in the higher grades. The CCSS specifically mention that students should have sufficient keyboarding skills to type one page at a sitting by grade four, with expectations for page length increasing in grades five and six (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). For states adopting the CCSS, assessments are administered online through the Smarter Balanced Assessment Consortium (SBAC) or Partnership for Assessment and Readiness of College and Careers (PARCC). Although the tests are not timed, student performance on open-ended items and performance tasks requiring them to type responses may be impacted by their ability to efficiently find keys and use word processor functions. Beyond CCSS assessments, writing permeates all levels of education with increasing complexity as students move to higher grades, so it seems plausible that the development of touch typing skills at the elementary level would contribute to higher writing quality through high school and beyond.

It is possible for writers to input text without formal touch typing instruction and even develop a system that results in keyboard efficiency (Grabowski, 2008). However, a systematic instructional process would help students arrive at adequate transcription speeds early enough in their educational careers to benefit from automaticity. Several states and districts have encouraged touch typing instruction in the elementary grades, with some indicating a minimum typing rate by the end of fifth grade (Fleming, 2002; Knox, 2003; North Carolina State Department of Public Instruction, 1995; Utah State Office of

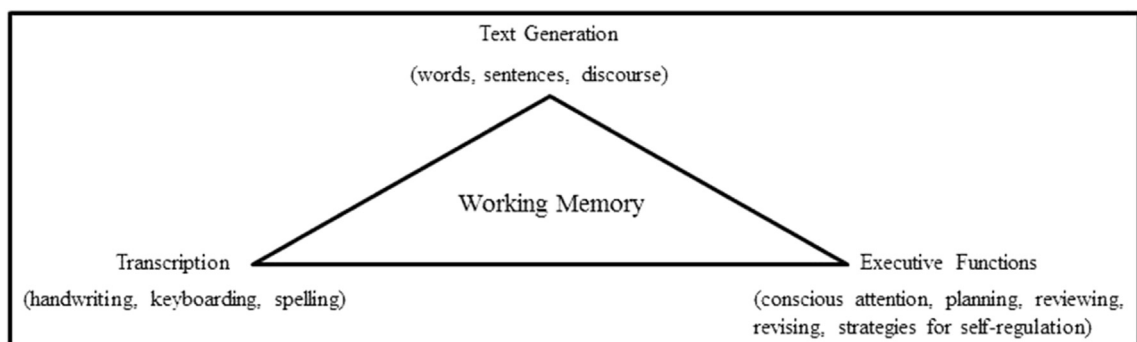


Fig. 1. Simple view of writing (Berninger et al., 2002).

Education, 2010) and others suggesting such instruction be augmented by training in using the word processor effectively (Parker, 1992; Roby, 1997). While there is not universal agreement, the literature suggests grade three as an appropriate time to begin touch typing instruction (Bartholome, 1996; Fleming, 2002; Jackson & Berg, 1986; Russell, 1994). Finger length, dexterity, and ability to concentrate are cited as limitations in teaching the skills to younger students. A typing speed of 20–25 words per minute is equivalent to the rate of writing by hand, a speed that reflects automaticity (Bartholome, 1996).

Touch typing involves cognitive, affective, and psychomotor skills, a combination of skills likely maximized through formal instruction (Fleming, 2002; Posnick-Goodwin, 2016). More and more educators are becoming aware of the growing importance of students' touch typing proficiency; however, despite the potential benefit of efficient keyboard entry, touch typing curriculum has not systematically been implemented into U.S. schools (Posnick-Goodwin, 2016). In fact, some educators argue that students will learn typing skills on their own (Fleming, 2002; Roblyer & Doering, 2010) or that the "hunt and peck" method is sufficient (Fleming, 2002). Notably missing from the research literature over the past two decades are studies examining the relationship between touch typing ability and writing quality. In addition, there is no current research examining whether elementary students are developing touch typing skills or whether teachers believe formal instruction of those skills is important. The purpose of this study was to examine teacher perceptions of and practices related to touch typing skill development.

2. Research questions

Two research questions were examined:

1. What are elementary teacher perceptions of the need for touch typing proficiency?
2. What touch typing curriculum and practices are being implemented in elementary schools?

3. Research design

3.1. Methodology and data analysis

The study was a mixed-methods explanatory design (Plano Clark & Creswell, 2010). In such designs, the quantitative phase is followed by a qualitative phase, which is used to help explain and refine the results achieved from the quantitative data (Bryman, 2006). The combination of methods in this study provided an opportunity to solicit possible explanations for survey results.

The quantitative phase consisted of a survey administered via the Qualtrics online survey platform to grades three through six public school teachers. Since there was no previous research related to the research questions, a survey instrument was created for the study. The survey gathered demographic data about the participants and also requested information about current touch typing practices and perceptions of the need for student touch typing skills. The survey was administered in September 2014. Content validity was established by soliciting feedback about the instrument items from a team comprised of technology-using educators. The survey consisted of 14 items with a range of response options, four items that asked participants to select a response to a question, and one open-ended item. There were also five items on the survey related to participant demographics. The survey is included in Appendix A. Survey responses were imported into the Statistics Package for the Social Sciences v. 22, where descriptive statistics and contingency tables were analyzed. Responses were analyzed using Chi Square Contingency Tables to determine if there were differences in responses based on the county, teaching experience, grade level taught, and amount of technology available at the site.

The qualitative phase commenced after survey results were analyzed. Interviewees consisted of a sample of the teachers who participated in the survey. Phone interviews occurred during October and November 2014 and were audio recorded for the purpose of transcription. Semi-structured interviews were 10–15 min in length. Transcripts were read and then reread independently by both researchers, with themes identified and agreed upon. A grounded theory approach was used to analyze the data (Strauss & Corbin, 1994).

The study was approved by the California State University Stanislaus Institutional Review Board. Survey and interview participants consented to their participation as human subjects in a study.

3.2. Sample

3.2.1. Survey

Because the purpose of the study was to provide an overview of current practices and opinions, elementary teachers from schools and districts of varying sizes and locations were solicited. Grades three through six teachers in self-contained classrooms were targeted. Eight California County Office of Education websites were accessed to find the names of the county's public districts and schools. Independent and charter schools were excluded, as were schools that primarily served students with special needs. When sixth grade was part of an intermediate level school, it was not included in the list of eligible schools. Of the 840 schools meeting the criteria, 100 were initially selected using a random number generator.

Once schools were chosen, the email addresses of the principal and third through sixth grade teachers were obtained from school websites. An explanatory email message introducing the study was sent to principals, with a request for their support and confirmation of correct teacher email addresses and grade levels; 28% of principals responded. Invitations to participate were then sent via email to 1505 teachers in grades 3–6 at the selected schools. However, nearly a third of the invitation requests came back undeliverable or were denied by district filters, and others went to teachers outside the grades 3–6 range. A reminder message was sent to non-respondents one week after the initial invitation. From the first wave of invitations, 155 responses were received. To generate more responses, another 80 schools were randomly selected from the original list. Email invitations were sent to 809 teachers in this second wave of schools, with about 30% undelivered. A total of 268 responses were received between the two waves of solicitations, which is 11.6% of those invited but closer to 25% of those who actually received the invitation. Nulty (2008) research found response rates to surveys are often around 33%. Table 1 displays the demographics of participants, a sample that reflects the aging teacher pool within the state (Suckow & Purdue, 2015). Those listed as “other” were teachers who taught multiple grade levels. Teachers who completed the survey were eligible for one of two \$50 gift cards from an online retailer.

3.2.2. Interviews

After the survey data were analyzed, phone interviews were conducted with 12 teachers who had indicated on the survey that they were willing to participate in a follow-up interview to probe more deeply with regard to survey results. The teachers were purposefully selected to reflect the range in grade levels, years of experience, and counties represented in the sample. Calaveras and Tuolumne counties had just 3 and 8 survey respondents, respectively, with no teachers from those counties volunteering to participate in interviews. Table 2 reflects the demographics of interview participants. Interview questions probed for perceptions about the importance of touch typing skills among elementary students, impediments at the site with regard to teaching students to touch type, the nature of discussions at the site and district level related to formal keyboarding instruction, the relationship between a writer’s ability to touch type and the quality of writing, how much performance on standardized tests will be impacted by touch typing ability, and why there was a disparity on the survey between teacher perceptions of the importance of touch typing skills and formal keyboarding instruction.

4. Results

While the surveys were completed first and results were used to formulate interview questions, the results of both data collection methods are combined in the results section organized around themes that emerged during data analysis.

4.1. Perceptions about the need for touch typing skills

4.1.1. Importance of touch typing skills

Survey respondents made it very clear that they thought touch typing proficiency was important for elementary students. In fact, 48.5% of respondents indicated grades 1–2 was the ideal time to begin teaching touch typing, and another 43.5% suggested grades 3–4 was ideal. Just under half of respondents thought it was important or necessary for students to type at least as fast as they could write by hand by completion of fourth grade, while 80.3% indicated it was important or necessary by the end of grade 6, as shown in Table 3.

4.1.2. The connection between touch typing and writing

Most of the interviewed teachers who commented on the importance of typing proficiency felt the primary need for the skill was related to how long it took for students to complete writing tasks when keys had to be located one at a time. Teachers viewed the use of technology as more time consuming in the writing process than if students wrote by hand. Several of the interviewee’s comments about time taken to enter text align with the Berninger et al. (2002) model regarding cognitive capacity for writing. One interviewed teacher said, “If you’re trying to find the w, the train of thought of writing is interrupted.”

Table 1
Demographics of survey participants.

County	# (%)	Grade level (%)					Years of teaching experience (%)					
		3	4	5	6	Other	<5	6–10	11–15	16–20	21–25	>26
Alameda	30(11.5)	24.1	24.1	27.6	10.3	13.8	13.3	20.0	23.3	13.3	16.7	13.3
Calaveras	3 (1.2)	0.0	33.3	0.0	33.3	33.3	33.3	0.0	66.7	0.0	0.0	0.0
Contra Costa	28(11.2)	26.9	19.2	34.6	7.7	11.5	14.3	28.6	17.9	17.9	10.7	10.7
Merced	13(5.2)	7.7	15.4	30.8	23.1	23.1	23.1	7.7	15.4	46.2	0.0	7.7
Sacramento	76(30.3)	36.0	17.3	20.0	13.3	13.3	10.5	14.5	23.7	22.4	15.8	13.2
San Joaquin	37(14.7)	32.4	35.1	16.2	10.8	5.4	24.3	21.6	21.6	10.8	10.8	10.8
Stanislaus	56(22.3)	25.0	25.0	23.2	10.7	16.1	29.1	12.7	12.7	16.4	9.1	20.0
Tuolumne	8(3.1)	25.0	25.0	12.5	0.0	37.5	12.5	12.5	0.0	62.5	12.5	0.0
Overall	262	28.2	23.0	23.0	11.7	14.1	18.3	17.1	19.5	19.9	12.0	13.1

Note: Total participants reflect some who declined to specify grade level, county, or teaching experience.

Table 2
Demographics of interview participants.

Participant	Gender	Grade level	Years of experience	County
1	Female	4	25+	Sacramento
2	Female	5	25+	Sacramento
3	Female	5	21–25	Sacramento
4	Male	3	11–15	Contra Costa
5	Female	5	16–20	Alameda
6	Male	4	6–10	Alameda
7	Male	6	5 or less	San Joaquin
8	Female	3	5 or less	Contra Costa
9	Female	4–6 combo	16–20	Tuolumne
10	Female	5	6–10	Alameda
11	Female	5–6 combo	11–15	Sacramento
12	Female	Special day K-3	25+	Stanislaus

Another teacher explained in the interview, “*We haven’t taught them to type out answers. Right now they have to figure out where the keys are, which distracts them from the actual writing process.*” One of the interviewed teachers hypothesized that locating keys would be an additional impediment to writing among non-touch typing proficient English Learners (ELs), adding to this group’s struggle to express themselves in writing.

Previous research has indicated the potential benefit of word processors for writers who do not possess good handwriting skills (Cochran-Smith, 1991; Outhred, 1994; Watt, 1983). An observation of this effect was noted by one interviewed teacher who commented that students have more confidence when using a keyboard for text entry. Similarly, one teacher commented, “*Some students love to write, but the physical act of writing in a journal or notebook is tough for them to sustain over a period of time.*”

Teachers’ beliefs regarding the positive effects of using word processors in general contributed to their perception that touch typing skills were important for students to acquire. Surveyed teachers overwhelmingly felt that ability to touch type influences overall writing quality when word processors are used, with 72.4% of teachers indicating quality is influenced either quite a bit or a lot, and an additional 20.9% indicating touch typing contributes enough to writing quality to at least be helpful.

Despite this favorable view overall, it was evident that many of the study participants saw touch typing and word processing independent of the writing process. One interviewed teacher said:

Touch typing would come in in the final stages of publication and there are so many other elements going on like organizing, genre, voice, and word choice. There are so many different elements to writing a good narrative or essay. Keyboarding is important in terms of the final product ... It would be an advantage for some students whose cursive is terrible; it would take some of the stress out of the publication process for them.

Another commented:

I don’t see a correlation with quality as long as they have the opportunity to handwrite ahead of time. I see a problem when students do a rough draft on the computer and I don’t see what they’ve revised and edited before the final version. I see more and can provide more instruction if they handwrite first.

This thought was echoed by another teacher who said, “*Students can handwrite. I don’t think them being able to type helps them to be better writers.*” These comments suggest that despite increased access to technology and the emphasis on the writing process in curriculum, there continues to be a substantial number of teachers who prefer traditional approaches to writing instruction, approaches that incorporate technology only in the final phase.

4.1.3. The impact of touch typing on standardized test performance

Participating teachers taught in California, one of the states that adopted the CCSS. Survey participants were in agreement that inability to touch type would have a detrimental effect on student performance on CCSS-based tests. In fact, 86.5% of respondents indicated that touch typing proficiency would impact performance on the SBAC either quite a bit or a lot, with another 10% answering “enough to be helpful.” Those interviewed indicated that if students cannot type quickly or accurately enough, they experience frustration while taking computer-based tests, diminishing their performance on the test. One teacher explained that lack of touch typing skills could negatively impact the performance of even good writers if they could not find the keys needed to express themselves during computer-based testing. Interview results indicated that despite schools not offering formal instruction in touch typing, students would get practice by virtue of engagement in word processing activities. One interviewed participant noted, “*Teachers don’t think about teaching typing skills since there is not a typing test on the SBAC. They don’t think about how the process of typing impacts performance.*” One survey respondent wrote, “*Our district doesn’t seem to understand how important keyboarding is to the success of writing, college prep, and the SBAC.*” One interviewed teacher espoused that the performance of low-income kids would be most severely impacted by lack of typing

Table 3

Percent of respondents indicating the importance for students to touch type at least as fast as writing by hand.

	Unimportant	Probably helpful	Helpful	Important	Necessary
By completion of third or fourth grade	2.7	7.7	43.8	28.5	17.3
By completion of fifth or sixth grade	0.4	2.3	17.0	44.0	36.3

skills, since this group of students had fewer opportunities to build proficiency outside of school than their more affluent peers.

4.2. Touch typing practices

4.2.1. Touch typing instruction

Table 4 shows the distribution of responses to the survey item asking participants if they taught their students to touch type. Almost half of the respondents claimed they engaged their students in touch typing instruction at least sometimes. However, 66.8% of respondents indicated primary responsibility for teaching students to touch type should fall on someone who is hired as a computer lab support person, media specialist, or equivalent. Just 21.2% of respondents felt the classroom teacher should teach students to touch type.

Among those indicating they teach their students to touch type, 83% said their students practiced weekly. Thirteen different typing instruction programs were mentioned by teachers in the survey, with Dance Mat Typing being the most frequently mentioned (12 responses), followed by TypingWeb (10), Typing Club (8), and Type to Learn (7).

About 50% of survey respondents indicated at least some discussion about touch typing curriculum had occurred at the site level (noted in Table 5), which roughly parallels responses to the question about whether formal touch typing instruction has been implemented. Touch typing was more likely to be discussed at schools having at least adequate access to technology. When touch typing instruction was offered, the highest frequency of respondents indicated it was taught in third grade (32.4%), with smaller percentages indicating grades four (26.3%), five (23.7%), and six (19.5%).

4.2.2. Touch typing and the CCSS

The shift to Common Core Standards has forced many elementary teachers nation-wide to revamp their curriculum. Pressure associated with this curricular change is one of the themes identified from the qualitative data. The amount and depth of content teachers feel accountable to cover precludes adding “extra” things like touch typing instruction. One interviewed teacher explained that due to the switch to the CCSS, “... there is no built-in time in my master schedule for typing.” Another participant posited, “We have to choose our battles. If we have to choose between teaching typing and teaching math or teaching typing and teaching language arts, teachers will choose math and ELA first.” Another teacher said, “In terms of priorities, keyboarding is kind of low on the list. It would be nice, but it’s not a priority.” This reality may help to explain the high percent of teachers who indicated touch typing instruction should be delivered by someone other than them.

4.2.3. Typing activities and skills

Table 6 indicates the survey response distribution regarding frequency of word processor use for writing, along with perceived student touch typing proficiency. Over 70% of teachers who responded indicated their students write drafts by hand first more than 50% of the time. Few teachers reported that their students could enter text fluently or that their students could type more quickly than writing by hand. Statistically significant differences were found when contingency tables examined responses by teacher grade levels, with higher reported typing proficiency as student grade levels increased ($\chi^2(20, N = 247) = 64.86, p < 0.001, \text{Cramer's } V = 0.26$), as expected. Another significant finding was that greater percentages of students were identified as being able to type text as fast as they could write by hand or faster if they were at schools with at least adequate access to technology ($\chi^2(20, N = 247) = 37.74, p = 0.01, \text{Cramer's } V = 0.20$). In addition, as access to technology increased, teachers reported their students spent less time writing drafts by hand first ($\chi^2(16, N = 246) = 33.03, p = 0.007, \text{Cramer's } V = 0.18$).

4.2.4. Access to technology

Student access to technology was a clear impediment to the development of touch typing skills. Even though elementary schools are moving in the direction of 1:1 computing environments, many schools in the study had modest access to digital

Table 4

Are you involved in teaching your students to touch type?

Response	Percent
Yes, I do formal touch typing instruction/practice with my students on a regular basis	12.3
Yes, I engage students in touch typing instruction/practice periodically	37.5
No, I do not engage students in touch typing instruction, but others at my site do	22.5
No, I do not engage students in touch typing instruction; I'm not sure if others do	27.5

Table 5

Does the school or district have a touch typing curriculum in place for elementary students?

Response	Percent
Yes, students access an online keyboarding tutorial and progress at their own pace	25.0
Yes, students receive face to face instruction plus practice exercises	8.2
Yes, the students receive some type of instruction, but I'm not sure of the curriculum	22.7
No, students do not receive any type of keyboarding curriculum	34.4
I am not sure	9.8

devices. Surveyed teachers felt the limited availability of digital devices negatively impacted opportunities to teach students touch typing, especially since computers in lab and cart settings are removed from instructional use for two or more months per year during assessment periods. One interviewed teacher explained the limitation of access. She said:

In the case of handwriting, you can have students practice during free time or when their other work is done. Even when they're writing a story they're practicing handwriting, but there are not enough computers in the classroom to practice typing skills. If schools have carts, then students can practice typing, but we don't have that. Even with carts, it's not a smooth transition; it has to be a specifically designated activity. You have to bring the cart in, distribute the computers, or you have to line kids up and walk them down to the lab.

Survey results indicated teachers in schools with robust access to digital devices were more likely to teach students touch typing than schools that had lesser access to technology ($\chi^2 = 38.52$, $p = 0.001$, Cramer's $V = 0.20$).

5. Discussion

5.1. Time for touch typing instruction

Over the past two decades, external constraints such as curriculum and time were repeatedly identified in studies examining various barriers to technology integration (Berg, Benz, Lasley, & Raisch, 1998; Ertmer, Gopalakrishnan, & Ross, 2001; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). Touch typing curriculum does not fall under what would typically be considered “technology integration” since it does not have a curricular connection; however it is becoming an increasingly necessary skill in order to maximize student use of academically-oriented technology applications as well as for writing in general. While teachers talked about the importance of and value in students having well developed touch typing skills, they claimed there was not enough time for them to actually teach the skills due to the demands of addressing the CCSS. Potential returns on instructional time invested in teaching touch typing skills as students enter subsequent text more expeditiously after instruction go unrealized.

Ertmer et al. (2012, p. 433) described a “barrier threshold” as the point at which barriers cannot be overcome even when teachers believe something is worthwhile. Results of this study suggest touch typing instruction is sitting right at this threshold for many elementary teachers. They believe touch typing skills are important for students to have, but barriers such as time, insufficient student access to technology, and perhaps lack of knowledge of touch typing instruction are too overwhelming to overcome.

5.2. Beliefs about writing instruction

Study findings suggest that a factor that may contribute to touch typing instruction practices is teachers' beliefs regarding whether drafts of writing tasks should be handwritten. Seventy percent of survey participants claimed their students write drafts by hand at least half of the time before using a word processor. A similar percentage of survey respondents indicated they thought quality of student writing was quite a bit or a lot better when students used word processors. It appears many teachers are reluctant to give up the practice of having students write drafts by hand prior to keyboard entry. If word processors are used primarily in the publishing phase of writing, teachers are missing out on the opportunity to use the technology to actually teach writing. This practice may also impact student performance on online open-ended assessment items that require them to type and edit drafts during the testing window. Without touch typing skills, it is likely that the quality of student writing is not substantially impacted by the use of word processors (Cochran-Smith, 1991).

5.3. Access to technology

Access to technology was found to be a barrier to touch typing instruction. Access may be a more challenging impediment to overcome than curriculum or time because teachers have less control over what is available to their students than what and how they teach their students. It is true that access to technology is becoming greater across the nation (Snyder & Dillow, 2013); however the National Educational Technology Plan's statement about providing learners with “... the resources they need when and where they need them” (U.S. Department of Education, Office of Educational Technology, 2010, p. xiii) has yet to become a reality at many of the schools included in the study. While access to technology was cited as a barrier to

Table 6

Response distribution (by percent) to questions regarding student typing activities and teacher perceptions of students' touch typing skills.

	0%	1–25%	26–50%	51–75%	76–100%
% of time students construct drafts by hand before word processing	7.5	13.0	9.1	25.2	45.3
% of students who can touch type fluently and accurately	30.9	43.4	10.2	3.5	0.4
% of students who can enter text via keyboard faster than writing by hand	40.6	37.1	5.5	2.0	0.4

integration in earlier studies (Berg et al., 1998), previous literature has not examined how technology access may be perceived as a barrier specifically in the development of students' touch typing skills. Unlike other activities and projects for which students use technology, touch typing skill development requires that each learner has access to a keyboard during instruction and practice. Touch typing instruction is difficult to carry out without sufficient access to technology resources.

Beyond availability for teaching touch typing, lack of access to digital devices may impact student performance on standardized tests in less obvious ways. Although the computerized tests do not have published time limits, the time taken hunting for keys while constructing open-ended responses and performance tasks might indirectly negatively impact student outcomes. One interviewed teacher explained that because computer labs were scheduled during testing time, students who were not finished would be bumped from machines as new classes came in. Students might not have sufficient time to complete test sections, or they might stop prematurely due to fatigue or frustration with finding keys.

5.4. General awareness of touch typing

Interviewed teachers cited the lack of time as a key reason why teachers did not deliver touch typing instruction to students. However, one of the interviewed teachers shared a different, quite revealing, response. She said, "*I don't think teachers are really analyzing it [why they are not teaching touch typing despite their belief that students should have the skill].*" This statement is supported by survey and interview responses indicating the absence of conversations about touch typing at the site or district level. Conversations about the role of touch typing skills in writing or about a systematic instructional process for teaching the skills have occurred only minimally in schools.

6. Implications and conclusions

Touch typing is not glamorous. It does not involve critical thinking, communication, creativity or collaboration. In fact, teaching touch typing skills may seemingly run counter to efforts to encourage teachers to use technology in ways that align with curricular objectives. However, touch typing proficiency is crucial to the development of 21st century skills, which engage many cognitive resources (Partnership for 21st Century Schools, n.d.). When students need to consciously hunt for keys, they are not able to dedicate their full attention to the writing task at hand (Berninger et al., 2002). While students might become somewhat adept with two-finger typing, "getting by" limits what they can ultimately produce (Fleming, 2002).

Teachers' personal experiences with and ability to touch type might have influenced their responses to the survey and interview questions. The vast majority of teachers who responded to the survey had limited access to digital devices as elementary students compared to what is available to today's pupils. What worked for them as students may no longer reflect the needs of today's learners. Some teachers need evidence that their instructional practices result in achievement (Ertmer & Ottenbreit-Leftwich, 2010), evidence that is currently only indirect in terms of providing time for touch typing instruction. There may be anecdotal indications about the relationship as teachers watch their students struggle with the physical act of typing during computer-based testing. These observations may be especially enlightening among teachers who do not typically accompany their students to a computer lab for instruction, and therefore are not aware of students' limited typing proficiency. Past standardized testing practices did not rely as heavily on technology as current tests do, so these observations may provide an opportunity for teachers to reflect upon potential changes in practice. Many teachers in the study justifiably claimed that they do not have enough time to incorporate touch typing instruction into their already-packed curriculum. Since they lack experience in teaching students touch typing, perhaps it is appropriate for teachers to consider how other staff can provide students this training.

More consistent instructional practices might be implemented if educators understand the long-term benefits of student touch typing proficiency. Rather than viewing touch typing as a stand-alone technology skill, an understanding of how transcription impacts the writing process might provide an awareness that contributes to broad discussions at the school and district level. Perhaps these discussions will result in agreement regarding how students can acquire the skills in ways that require teachers to divert minimal instructional time away from other curriculum. While a discussion of touch typing curriculum is beyond the scope of this study, several ideas have emerged in the literature as a way of "making time" for such instruction. For example, a five-consecutive afternoon "typing camp" with high intensity keyboard instruction could be a successful model (Newingham, 2010). Christensen (2004) found that an eight week small group typing skills curriculum resulted in a significantly higher quality of written work over a control group which did not partake in the typing curriculum. Fleming (2002) recommended trading some of the time that would otherwise be spent developing handwriting skills for touch typing practice. Bartholome (1996) provided a useful scope and sequence and general principles for teaching keyboarding. Dialog among educators at school and district levels can result in a plan based on the unique situation at each site.

This study suggests that there is much to discuss with regard to not only touch typing instruction, but how such instruction may also impact student writing skills.

7. Limitations

The study's sample size and procedures for sample selection suggest that conclusions should be viewed cautiously. It is possible that those who chose to respond to the survey did not share the same perspectives as those who did respond.

The study was conducted in fall 2014, several months before administration of the first official SBAC administration in California. When schools field tested the SBAC in spring 2014, problems with the number of available devices for testing and adequacy of bandwidth were widely published. However, there has not yet been enough time for districts to fully remediate those deficiencies. As schools and districts do so, the access barrier which was identified so widely by teachers in the study may decrease.

The study does not account for touch typing instruction that occurs prior to grade three or after grade six. It is likely that some instruction falls outside of the grades 3–6 window in some schools and districts. Since the sample, with just a few exceptions, was comprised of classroom teachers, it also did not account for instruction that may have occurred in media centers or computer laboratories. Another limitation of the study was the self-reported responses on the survey. The accuracy of survey results is always contingent upon the honesty of respondents.

Appendix A

Beliefs about Touch Typing Skills and Instructional Practices Survey

What grade level do you think is ideal for students to begin learning touch typing?

- 1–2
- 3–4
- 5–6
- Junior High/Middle School
- High School
- It's not necessary for students to learn touch typing in school

How important do you believe it is for students to be able to touch type at least as fast as they can write by hand by the time they complete third or fourth grade?

- Unimportant
- Probably Helpful
- Helpful
- Important
- Necessary

How important do you believe it is for students to be able to touch type at least as fast as they can write by hand by the time they complete fifth or sixth grade?

- Unimportant
- Probably Helpful
- Helpful
- Important
- Necessary

How much do you think a student's ability to touch type contributes to his or her overall writing quality when word processors are used in writing activities?

- Not At All
- A Little
- Enough To Be Helpful
- Quite A Bit
- A Lot

How much do you think students' ability to touch type contributes to their performance on SBAC and other assessments?

- Not At All

- A Small Amount
- A Medium Amount
- Quite A Bit
- A Lot

What grade level do you think is ideal for students to begin learning to use simple features of a word processor (i.e. font, alignment, spell/grammar check)?

- 1–2
- 3–4
- 5–6
- Junior High/Middle School
- High School
- It is not necessary for students to learn these skills in school

By what grade level should students be skilled with more advanced features of a word processor (i.e. cut, copy, paste, margins, tabs, find/replace, moving chunks of text)?

- 1–2
- 3–4
- 5–6
- Junior High/Middle School
- High School
- It is not necessary for students to be skilled in these areas

Who do you believe should have the primary responsibility to teach students to keyboard/touch type?

- Elementary classroom teachers
- Elementary lab teacher/assistant, librarian, media specialist, or equivalent
- Junior high/middle school classroom teachers
- Junior high/middle school lab teacher/assistant, librarian, media specialist, or equivalent
- High school elective class teacher
- I'm not sure who should be responsible
- I don't believe formal instructional time should be spent teaching keyboarding skills

When completing activities in your class that focus on developing writing skills, approximately what percent of time do students construct drafts by hand before they input text via technology-based devices?

- 0%
- 1–25%
- 26–50%
- 51–75%
- 76–100%

When considering your students as a whole class, about what percent would you say can touch type fluently and accurately?

- I don't know
- 0%
- 1–25%
- 26–50%
- 51–75%
- 76–100%

When considering your students as a whole class, about what percent would you say can enter text via a keyboard faster than they can write by hand?

- I don't know
- 0%

- 1–25%
- 26–50%
- 51–75%
- 76–100%

How familiar are your students with simple word processing functions (i.e. font, alignment, spell/grammar check)?

- I don't know
- Most are not familiar with these functions
- Some know a few functions
- Most know a few functions but not well
- Most know multiple functions and will carry out with prompting
- Most use with ease without prompting

How familiar are your students with more advanced word processing functions (i.e. cut, copy, paste, margins, tabs, find/replace, moving chunks of text)?

- I don't know
- Most are not familiar with these functions
- Some know a few functions
- Most know a few functions but not well
- Most know multiple functions and will carry out with prompting
- Most use with ease without prompting

How much has the idea of a touch typing/keyboarding curriculum been discussed at your school site?

- No discussion
- Some discussion by a few people or groups
- Some discussion at the school site level
- Moderate discussion at the site level
- Lots of discussion at the site level

Does the school or district have a touch typing curriculum in place for elementary students?

- Yes, students access an online keyboarding tutorial and progress at their own pace
- Yes, students receive face to face instruction plus practice exercises
- Yes, the students receive some type of instruction, but I'm not sure of the curriculum
- No, students do not receive any keyboarding curriculum
- I am not sure if there is any touch typing curriculum in place

Answer If Does the school or district have a touch typing curriculum in place for elementary students? Yes, students access an online keyboarding tutorial and progress at their own pace Is Selected Or Does the school or district have a touch typing curriculum in place for elementary students? Yes, students receive face to face instruction plus practice exercises Is Selected Or Does the school or district have a touch typing curriculum in place for elementary students? Yes, the students receive some type of instruction, but I'm not sure of the curriculum Is Selected

At what grade levels is the formal keyboarding curriculum taught? Choose all that apply.

- Grade 3
- Grade 4
- Grade 5
- Grade 6
- I am not sure

Are you involved in teaching students to touch type?

- Yes, I do formal touch typing instruction/practice with my students on a regular basis.
- Yes, I engage students in touch typing instruction/practice periodically.
- No, I do not engage students in touch typing instruction, but others at my site do.
- No, I do not engage students in touch typing instruction and I'm not sure whether others do.

Answer If Are you involved in teaching students to touch type? Yes, I do formal touch typing instruction/practice with my students on a regular basis. Is Selected Or Are you involved in teaching students to touch type? Yes, I engage students in touch typing instruction/practice periodically. Is Selected

Please explain how you structure the keyboarding teaching—how much time is spent, how you teach it, where you teach it, etc.

Does the school or district have a word processing curriculum (specific curriculum designed to teach students features of the word processor) in place for elementary students?

- Yes, there is a formal curriculum prescribed by the school or district.
- There is no formal curriculum prescribed by the school/district, but teachers do teach students to use the word processor functions.
- No, students do not receive any instruction with regard to learning to use word processing functions.
- I am not sure.

In what county do you currently teach?

- Alameda
- Calaveras
- Contra Costa
- Merced
- Sacramento
- San Joaquin
- Stanislaus
- Tuolumne

For how many full years have you taught?

- 5 or fewer
- 6–10
- 11–15
- 16–20
- 21–25
- 26 or more

What grade do you currently teach?

- Grade 3
- Grade 4
- Grade 5
- Grade 6
- Other (please specify in the box that appears on the next screen)

Answer If What grade do you currently teach? Other (please specify) Is Selected

- Please specify current grade level/teaching assignment
- Check all that apply with regard to access your students have to technology.
- One to one access to devices with a keyboard in the classroom
- One to one access to devices with an on-screen keypad (i.e. iPad, tablets) in the classroom
- Access to a portable lab of devices with a keyboard that can be reserved and used for one to one classroom use
- Access to a portable lab of devices with an on-screen keypad that can be reserved and used for one to one classroom use
- Classroom access to 1–3 student-use devices with an external keyboard
- Classroom access to 4–6 student-use devices with an external keyboard
- Classroom access to 7+ student-use devices with an external keyboard, but not enough for all students to use simultaneously
- Classroom access to 1–3 student-use devices with an on-screen keyboard
- Classroom access to 4–6 student-use devices with an on-screen keyboard
- Classroom access to 7+ student-use devices with an on-screen keyboard but not enough for all students to use simultaneously
- One to one access in a lab
- Less than one to one access in a lab

- Students can bring and use their own technology devices

How well does the technology (both amount and type) available to your students meet your instructional needs?

- Very poorly
- Poorly
- Adequately
- Well
- Very well

If you would like to be eligible for a \$50 Amazon or iTunes gift certificate (2 will be awarded), please type your email address here. Your email address will remain separate from survey responses so responses cannot be tracked to an individual.

If you are willing to participate in a 15–20 min phone interview in October or November that is designed to provide more depth than the survey responses, please indicate your email address below. Doing so does not obligate you, nor does it guarantee that you will be selected. Your email address will remain separate from survey responses so responses cannot be tracked to an individual.

If you would like to receive a copy of the completed manuscript when ready (likely in January), please indicate your email address below. Your email address will remain separate from survey responses so responses cannot be tracked to an individual.

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