Handwriting Relevance: Perceptions of Teachers and Occupational Therapists

An Honors Thesis (HONR 499)

by

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Abstract

The impact of technology can be seen in nearly every aspect of current society. Technology has changed the way we interact with each other and with the world. The field of education also feels this impact, as educators incorporate technology into their classrooms and into the curriculum. Due to technology’s impact, the relevancy of handwriting instruction has been questioned. Therefore, the purpose of this study was to compare the perceptions of teachers and occupational therapists regarding handwriting instruction and whether or not they believe it is still relevant. Furthermore, the study examined how these professionals perceive the impact of technology on students’ fine motor skills, handwriting skills, and how handwriting impacts student success, both within the classroom and within society.

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Technology is a buzzword. It is a buzzword in a variety of fields, including medicine, journalism, construction, and business. Technology impacts the way individuals interact with one another, through the widespread use of texting, Skype, and various social media. Whether one loves it or hates it, technology is everywhere, and it is here to stay.

The field of education has not been immune to the influence of technology. According to the 2014 Horizon Report, 24 states in the U.S. are now making use of a blended educational model, in which students spend part of the day in a traditional classroom and part of the day accessing materials online (NMC Horizon Report, 2014). Other examples of technology incorporation include the use of iPads, the block of time in a media lab, the use of a SMART Board, or the use of computers for standardized assessments. Educators differ on how they use technology, and many have differing opinions on technology’s impact, be it negative or positive.

When discussing technology’s impact on students, handwriting is an essential aspect to consider. Technology has influenced the debate regarding handwriting instruction, the effectiveness of handwriting remediation, and the relevance of handwriting as a skill in 21st century society. While some still regard handwriting as a crucial skill for students to learn in elementary school (Lust & Donica, 2011), research has shown that the common use of keyboards to write may lead to a loss of these skills (Suddath, 2009). Since keyboarding and handwriting have been shown to require different abilities (Preminger, Weiss & Weintraub, 2004), professionals concerned with the development of children need to carefully consider which abilities are important.
Research has also shown that a lack of handwriting skills in the primary grades could negatively affect later writing development (Graham, Harris, & Fink, 2000). Lacking handwriting automaticity can cause students to focus on forming the letters rather than on the complex task of writing (Jones & Christensen, 1999). Lack of handwriting skills may affect educational achievement in other ways. In Markham’s study examining how handwriting affects the evaluation of students’ work and their enduring educational achievement, results showed that handwriting is one of the factors that influence a teacher’s evaluation of a student’s work (Markham, 1976).

An extensive use of technology can have a broader impact on a child’s development. In a study discussing the effects of computers on basic motor skills, researchers found an extensive use of computers may largely impact the general features of human behavior and may shape one’s neuromotor foundations (Sülzenbrück, Hegele, Rinkenauer, & Heuer, 2011). It is crucial that researchers consider all of these potential impacts and inform policy makers, educators, and parents.

Although classroom teachers often take the responsibility of teaching handwriting skills to their students, many students are referred to school-based occupational therapists for handwriting difficulties (Clark-Wentz, 1997). Therefore, although it is clear that educators are central to the debate regarding handwriting instruction, occupational therapists are also an important contributor to this debate (Freeman, MacKinnon & Miller, 2004). Educators and occupational therapists need to discuss how technology has impacted handwriting skills, compositional skills, and overall development. In these ways, they must consider how technology has also impacted educational achievement.
In my research, I examine whether these professionals believe that handwriting is still important for academic success and how, if at all, technology has impacted its relevance. I hypothesize that regardless of the influx of technology, these professionals will still regard handwriting as an important skill. The purpose of my study is to compare the beliefs held by elementary school teachers with the beliefs held by occupational therapists regarding handwriting instruction.

Even apart from handwriting instruction, writing is still an essential part of the elementary curriculum. Research has shown that 30 to 60% of the school day is made up of writing tasks (Cutler & Graham, 2008). Therefore, it is important to understand how handwriting skills affect one’s ability to compose a written text. A group of researchers examined whether or not handwriting was causally related to learning to write. From a group of 310 first-grade children attending school in Washington, D.C., the researchers selected 38 students who were identified as being “at risk” in handwriting. The students were randomly divided into two groups. One group would receive handwriting instruction, while the other group would receive phonological awareness instruction. Each student was given 27, 15-minute long sessions of instruction. For the study, the students were assessed before instruction, after instruction, and then again six months later (Graham, Harris, & Fink, 2000).

Results of the study found that the students who received supplementary handwriting instruction had a statistically significant effect on the following components of handwriting performance: alphabet production, total number of alphabet letters written correctly, total number of letters copied correctly, and the total number of letters copied
correctly per minute. Most importantly, this group also had both short-term and long-term improvement in compositional fluency skills (Graham, Harris, & Fink, 2000).

From this research, the authors suggest that difficulties in adequate handwriting skills in primary grades may negatively affect later writing development. Furthermore, the authors discuss several educational implications. This study draws attention to the importance of explicit handwriting instruction for primary students. As the authors describe, explicit handwriting instruction for students “can increase the probability that they will become skilled writers” (Graham, Harris, & Fink, 2000. pg. 631). The authors also warn that current curriculums focus more on content and process than on form, which can result in a removal of this explicit instruction. Finally, the authors discuss the role that technology has played in the loss of handwriting instruction and warn against a reliance on such technologies. Since word processing is not the primary tool used by beginning writers, “handwriting should not be ignored in the early grades” (Graham, Harris, & Fink, 2000, pg. 631).

Apart from handwriting, good teachers are still concerned with the physical development of their students, which includes both gross motor and fine motor skills. Sülzenbrück, Hegele, Rinkenauer, and Heuer (2011) researched how frequent computer use affects basic motor skills. The research participants in their study were divided into two groups, based upon the amount of self-declared time they spent typing versus the amount of time they spent using handwriting. The computer group had 12 individuals with a mean age of 25.3 years, while the handwriting group had 8 individuals with a mean age of 23.6 years. Although the participants in this study are older than the target
population of the following research (primary age children), the study still speaks to the
long-term impact technology may have on the basic motor skills of children.

The groups were then given five different psychomotor tests, which tested the
following: precision and speed of movement, rapid repeated small-scale movements,
manual and finger dexterity, and wrist-finger speed. This is an older age group, much
older than your target population. Results found that the computer group performed 36%
slower than did the handwriting group when completing the line-tracing test
(Sülzenbrück, Hegele, Rinkenauer, & Heuer, 2011). No differences in accuracy were
found amongst the different speeds. Although speed was the only significant difference
between the two groups, it was significant despite a small sample size. This study
suggests that the amount of time one types or writes affects basic fine motor skills
(Sülzenbrück, Hegele, Rinkenauer, & Heuer, 2011).

Therefore, even if one does not value handwriting, one could argue that
handwriting preserves other needed skills. In fact, the authors of this study suggest that
the use of computers not only affects handwriting, but also affects the “more general
features of the human behavioral repertoire” (Sülzenbrück, Hegele, Rinkenauer, & Heuer,
2011, pg. 250). When speaking of the future, the authors discuss how an increasing
dependency on new technology could also “influence human abilities” (Sülzenbrück,
Hegele, Rinkenauer, & Heuer, 2011, pg. 250). This research changes the course of the
handwriting instruction debate. Professionals must not only determine if technology
affects the relevance of handwriting, but they must also determine if it affects the
relevance of the skills used to have good handwriting. One limitation of this study is that
it did not address the perceptions of handwriting held by the participants.
Fine motor skills are not the only area of development that technology can impact. Li and Atkins (2004) researched how computer experiences affect cognitive and motor development. The participants included in this study were 122 preschool-age children. These children were enrolled in a Head Start program and came from families with a median income of $11,662. The children were given assessments by psychology graduate students that tested their visual motor skills, school readiness, gross motor skills, and cognitive development. Parents were also asked about their child’s early computer experience (e.g. Is there a computer at home?).

Results found that 56% of the children had access to a computer, either in the home or outside of the home. Computer accessibility was correlated with family SES, with families of higher SES having greater accessibility. Accessibility of use was also positively correlated with cognitive test scores, psychomotor test scores, school readiness, and estimated IQ. However, frequency of use did not correlate with any of these measures. Similarly, an inverse correlation occurred when examining the relationship between SES and frequency of use (Li & Atkins, 2004).

These results indicate that computer accessibility and frequency of use are very different variables. Computer accessibility does seem to have a positive effect on a child’s cognitive development. However, since frequency of use did not correlate with performance measures, it seems that the quality of time on a computer, not the quantity of time, is important (Li & Atkins, 2004). This study cautions educators and therapists from simply replacing handwriting with technology for the sake of technology. It seems, that in order for technology to positively affect children, it must be used purposefully. One limitation of this study is that it did not address how the directors of the Head Start
program perceived handwriting and/or the impact of technology on gross motor skills, fine motor skills, and cognitive development.

The impact of technology on a child’s development should resonate with educators and therapists. Research has found that technology impacts development by potentially determining the basics of human skills (Sülzenbrück, Hegele, Rinkenauer, & Heuer, 2011), but one must also ask which abilities are required for good handwriting. Preminger, Weiss, and Weintraub (2004) compared handwriting skills and keyboarding skills in their study. They wanted to determine whether “similar performance components predict handwriting and keyboarding accuracy and speed” (Preminger, Weiss & Weintraub, 2004, pg. 194).

The participants in the study were 63 5th grade students from a school in Israel, and none of the students had received previous therapy. In the study, students were assessed on the performance components thought to be related to handwriting and to the beginning stages of learning touch-typing skills. Then, students were given five hours of instruction on touch-typing skills and were reevaluated. Although the length of instruction was short, the students’ percent-accuracy for both handwriting and keyboarding was high (greater than 90%). In contrast, their handwriting speed was much faster than their keyboarding speed. When using handwriting, students wrote almost double the letters than when typing (Preminger, Weiss & Weintraub, 2004).

The authors were unsure of whether or not these correlations would hold true in the long run. Nonetheless, the significant finding of this study is that handwriting and keyboarding do require different abilities. Handwriting was correlated with visual-perception and motor-coordination abilities, while keyboarding speed was correlated with
kinesthetic abilities (Preminger, Weiss & Weintraub, 2004). Once again, it seems that professionals must determine which abilities are important to foster within children. The authors suggest that these findings provide evidence that keyboarding is a viable alternative for students with handwriting difficulties, especially if accuracy is the issue. However, the authors also advise that having students use keyboard for writing “will not necessarily solve their writing difficulties” (Preminger, Weiss & Weintraub, 2004, pg. 200). Keyboarding cannot be viewed as the magic bullet.

Educators will need to decide what role handwriting instruction will play in their teaching, while therapists decide how it will impact the services they provide. Jones and Christensen (1999) also examined the relationship between handwriting and a students’ ability to generate written text. Similar to Graham and colleagues’ study, these authors also use their research to discuss implications for school curriculum. Their research was broken up into two different studies. In the first study, the participants were 114 students in their second year of schooling in Australia. The second study’s participants were 38 students also in their second year of schooling. Of these 38 students, 19 of them had orthographic-motor integration difficulties, while the other 19 students made up a control group. As described by the authors, orthographic-motor integration involves a “visual representation specific to written symbols, clusters of letters, and words” (Jones & Christensen, 1999, pg. 44).

Both groups of students were given tests that assessed the following: reading, writing speed and accuracy, and written expression. Results from the study found that when reading was controlled, 53% of the variance in story writing was due to one’s speed and accuracy in writing letters (Jones & Christensen, 1999). From this, one can conclude
that orthographic-motor skills significantly affect the student's ability to generate written text. In other words, a lack of automaticity in handwriting causes students to focus on forming the letters rather than on the complex task of writing (i.e. ideation, planning, monitoring). The authors discuss how well meaning curriculums may have “unintended negative consequences” if they leave out opportunities to practice orthographic-motor skills (Jones & Christensen, 1999, pg. 48). This research suggests that educators examine their own curriculum.

This study agrees with Graham and colleagues’ study on the importance of intervention or supplemental instruction. The students in the second study received intervention. Before the intervention, when handwriting scores were measured, the control group was significantly better. However, after the intervention, there was no difference at posttest between the control group and the group with identified orthographic-motor integration difficulties (Jones & Christensen, 1999). The success of this intervention points to its effectiveness and suggests that educators and therapists work to identify handwriting difficulties and find ways to intervene.

In a more proactive approach to intervention, researchers examined the effectiveness of a handwriting-training program for students in Kindergarten. The participants in the study were 100 Kindergarten students from four different classrooms in Israel. Fifty-five of the students were included in the study group, while 46 of the students were included in the control group. None of the students were identified as having intellectual or physical disabilities. Before instruction was given, the students were assessed on the following parameters: quality of one’s written name, the directionality of letter formation, the quality of the written lines, the overall intensity of
the lines used to form the letters, letter formation, writing on the lines, spaces between the letters, spacing between the words, pencil grasp, and use of non-dominant hand (Lifshitz & Har-Zvi, 2014).

The study group received instruction from the “Traffic Light” writing program, which sought to prepare children for efficient and flowing handwriting. In contrast, the control group received instruction from the “Word and Sound” program, which focused on phonemic awareness. After 3 months of 12 weekly sessions (each 20 minutes), the students were reassessed.

Results found that students in the study group had significantly greater improvement than the control group in respect to the following: letter formation, quality and intensity of the written line, spatial positioning of the letter, letter formation, and writing letters on the line (Lifshitz & Har-Zvi, 2014). Since both groups improved in handwriting speed, no significant difference was found here. However, students in the handwriting readiness group (Traffic Light) had a greater increase in “their positive reactions to writing than did the children in the control group” (Lifshitz & Har-Zvi, 2014, pg. 53).

Educators cannot ignore the significant increase in positive reactions. Fostering engagement and a motivation to learn are important goals for all educators. Lifshitz and Har-Zvi’s study suggests the effectiveness of a handwriting readiness training program in Kindergarten in preparing these students for first grade. A different study also examined the handwriting of kindergartners but sought to determine how their printing was associated with their academic performance throughout the first grade. Specifically, the
study investigated the form errors of the kindergarteners (i.e. adding, deleting, or misaligning parts of a letter) (Simner, 1982).

The participants in the study were 166 kindergarten children, who were divided into three different groups. Each group was tested at a different time during the year (fall, midwinter, spring). In the test, each student was asked to print each of the 41 reversible letters and numbers from memory after being exposed to it for 2.5 seconds (either by slides or by flashcards). From there, form errors were determined. For two of the groups, teachers were asked to rank the children according to readiness for first grade (i.e. academic performance in kindergarten). For the third group, teachers were asked to evaluate the students on overall in-class performance in first grade (Simner, 1982).

Results show that the occurrence of form errors was associated with academic performance, as was measured at the end of kindergarten and throughout grade 1. The study also showed that students who produce few or a large number of form errors behave similarly when tested again. Since form errors are related to future academic performance, it is important that teachers not overlook these errors. They further suggest that educators attend to the handwriting of their students (Simner, 1982). Although this study included teacher evaluation in the research, the teachers were not asked about their perceptions regarding handwriting or its importance.

In this study, Simner found that handwriting is related to future academic success. The connection between handwriting and academic achievement is an important connection to consider, as it impacts the relevancy of handwriting. Markham (1976) examined the influence of handwriting quality on teacher evaluation of written work. The participants in the study were 45 teachers from four elementary schools in a medium-
sized southwestern city and 36 university students who were student teaching in the same area. All of the teachers were working in regular classrooms, grades one through five (Markham, 1976).

Within a 5th grade classroom, students were asked to write descriptive papers. These papers were then typed and judged based upon quality of content. Of these papers, nine were selected (three good, three medium, and three poor in content). Then, each paper was copied into nine styles of handwriting. Then, the teachers and student teachers were given the papers to grade. Each participant received all nine handwriting styles and all nine content forms. Based upon quality of content, the participants were told to rate on a nine (brightest) to one (lowest) scale. In total, 729 papers were graded (Markham, 1976).

Results found that the characteristics of the teachers themselves were not found to explain the variance of scores. It was found that papers with better handwriting consistently received higher scores than those with poor handwriting, regardless of the quality of content. The author suggests that this study provides support for the teaching of handwriting skills. Overall, the study found that handwriting is “one of the non-content factors which may influence a teacher’s evaluation of children in his or her classroom” (Markham, 1976, pg. 280). A limitation of this study is the lack of input from teachers on the importance of handwriting for future academic success. Although both Simner’s study and Markham’s study are dated, both are relevant to my study because both speak to the ways in which handwriting impacts academic achievement.

Educators should not dismiss handwriting if it affects a teacher’s evaluation, and consequently, his or her students’ academic success. While this study focused on the
evaluation of students in the elementary grades, a different study focused on the evaluation of students in the undergraduate college level. This study examined the relationship between the handwriting fluency of undergraduate students and their writing quality, as it was assessed under exam performance and non-exam performance conditions (Connelly, Dockrell, & Barnett, 2005).

The participants in the study were 22 undergraduate students at the South Bank University in London. These students were in the second year of their psychology degrees, and all were social science students with a background in science. The undergraduate students were asked to write out the letters of the alphabet, in order, as fast as they could in one minute. This was assessed with a handwriting fluency measure. Then, the students were given two writing tasks. In the first task, the situation was non-pressurized. The students were asked to complete a short, pre-seen essay in an hour using pencil and paper. It was meant to be a formative experience that prepared them for the actual exam. For the second writing task, the students were asked to write another essay, but this essay would count for a substantial portion of their overall grade (Connelly, Dockrell, & Barnett, 2005).

The results of the handwriting fluency assessment indicate that the undergraduate students produced a mean number of letters per minute that reflected that of an eleven-year-old child. In the non-pressurized exam, the handwriting fluency measure was not associated with the quality of the essay. However, the fluency measure accounted for 30% of the variance in the exam essay. Similar results were found with the rubric score. The fluency measure accounted for 40% of the variances for the rubric score. In total, the
"overall score correlates significantly with handwriting fluency" (Connelly, Dockrell, & Barnett, 2005, pg. 101).

This study suggests that these students received lower marks on their essays, not because they knew less of the content, but because of a lack of handwriting fluency. Research was based upon the idea that "any activity that can be automatized frees up more working memory resources for other activities" (Connelly, Dockrell, & Barnett, 2005, pg. 103). Based upon this idea, if handwriting is not automatic, less working memory can be put towards the writing of the essay. Since this study was conducted approximately ten years ago, it could be argued that the handwriting fluency scores of the undergraduate students would remain the same or likely be lower. One limitation of this study is the lack of professor input. Overall, this study suggests that handwriting instruction is still relevant and has implications throughout one's college education (Connelly, Dockrell, & Barnett, 2005).

In the next study, researchers examine the use of computers in a traditional essay examination. In other words, the use of handwriting would be replaced by the use of a keyboard. The rationale behind this study speaks to Connelly, Dockrell, and Barnett's study. If students do not get much practice with handwriting before they use handwriting for assessment purposes, the validity of the assessment is compromised (Mogey, et al., 2008).

The participants in this study were fifteen university students, who volunteered in response to an invitation by the Students' Association. The students represented 11 different schools from the university. Six of them were males, and nine of them were females. All of the participants had regular access to a computer outside of the university
campus. First, the group was given an introduction and background of the project. Since
the stimulation examination would be done on a tablet, the students were given a
demonstration of the tablet’s features and time to use it. A separate demonstration was
given on the examination software. After a break, the group took the simulation
examination, completed paper feedback forms, and participated in two focus group
discussions (Mogey, et al., 2008).

Results show from the paper feedback forms that when asked, “Do you think it is
a good idea to use computers for exams?” most said “yes, but”. In other words, students
could see the computers being used but only under certain conditions. Some students said
only for some subjects (e.g. not for subjects with lots of formulas), only for some types of
exams, and only for some students (e.g. students with disabilities). Many thought that
rotating the screen was time-consuming, awkward, and distracting. They all thought it
was important to give sufficient practice time, and many were concerned about the
differences in typing speed. However, the students were not concerned with the
differences in handwriting speed in traditional essay examinations and did not view these
differences as equivalent. In essence, students felt that the differences in typing speed
were unfair but did not feel that the current differences in handwriting speed are unfair.
(Mogey, et al., 2008).

Although using another tablet could change the awkwardness of the screen, other
comments are more difficult to address. The students felt that they would write
differently (i.e. changing it more as you go along) or that they would be assessed
differently (i.e. held to a higher standard because it is typed) if using such technology.
The authors admit that determining how and when it would be appropriate to use
technology-based assessments is still an important issue for discussion (Mogey, et al., 2008). If more universities turn to computer-based assessments, it could be argued that handwriting instruction is less of a priority, since students will not need it to be academically successful in the long run. Nonetheless, until that occurs universally, educators should be cautious in assuming that is the case.

The future of technology is difficult to predict. One possibility of technology is the use of touchscreen phones. One study compared children’s writing and drawing on paper with their writing on touchscreen phones. The interesting aspect of this study is that the modalities were compared for the purpose of providing materials to children in developing countries. As the authors discuss, mobile phones were used in this study rather than computers, due to the cost of computers and the popularity of phones. The participants in this study were 38 students (20 male and 18 female) and represented an age range from 8 to 13 years of age. The students attended two primary schools in Panama (Valderrama, Kubitza, Henze, & Schmidt, 2013).

Each participant was asked to complete six tasks. The six tasks were as follows: draw two parallel lines, draw a square, draw a circle, draw a tree, write the numbers 0 to 9, and copy a sentence with five words. The tasks were assessed on the following performance measures: “task completion time, number of strokes to complete a phrase, participants’ preference and the legibility assessed by teachers” (Valderrama, Kubitza, Henze, & Schmidt, 2013, pg. 2). In all, the following four conditions were examined: pen and paper, capacitive screen with finger, capacitive screen with stylus, and resistive screen with stylus (Valderrama, Kubitza, Henze, & Schmidt, 2013).
The results showed that when assessing speed, the numbers were written the fastest using pen and paper. Furthermore, most teachers (92%) rated the pen and paper as the most legible. However, the authors discuss the possibility that the students would need more practice with the technologies in order to improve the speed and legibility of the tasks. Based upon feedback from the participants regarding the technologies, the students suggested that the touchscreen with a capacitive screen is the best tool and suggested the use of a styli for writing and fingers for drawing (Valderrama, 2013).

This study adds to the discussion of technology’s role in education. As suggested in this study, if these materials are distributed to developing countries, technology can serve as a powerful tool in education. The use and distribution of these materials in developed countries is an important discussion for professionals to have. Overall, this study did aim to include teachers in the process, both in the development of the tasks and in their assessment. One limitation of this study is the lack of teacher perception regarding the different modalities (i.e. pen and paper versus touchscreen phone).

Another way technology could be used in the future is through the use of a computer-based program for handwriting. In their study, Roberts and Samuels (1993) compared the effectiveness of a computer-based program for handwriting remediation with the effectiveness of a traditional approach. The participants in the study were 36 students, who were selected by teachers or by occupational therapists as having poor handwriting (i.e. handwriting that interfered with the completion or the legibility of their work). The students were between grade 4 and grade 6. Since there were three treatments, the 36 students were split into three groups of 12 students each (10 boys and 2 girls). Each group had 2 students with mild disabilities (Roberts & Samuels, 1993).
During the pretest sessions, all students were asked to perform two handwriting tasks and five transfer tasks. During the tasks, the students were asked to only use cursive handwriting. Results of the test were used to guide treatments. The three different groups were taught with three different instruments: traditional pencil and paper, traditional computer with touch screen, and an Apple tablet with electronic pen. Each of the treatment groups received seven lessons lasting 40 minutes each. During instruction, appropriate formation of the letters, not speed, was emphasized. Posttest samples were then taken. All of the writing samples (pretest and posttest) were then scored (Roberts & Samuels, 1993).

Results indicate that within the computer-based handwriting exercises group, significant differences were found in computer exercises and in teacher rating. In the conventional handwriting instruction using the computer, significant differences were found in closure and in parent rating. In the traditional paper and pencil group, significant differences were found in size relations, baseline orientation, letter formation, parent rating, and teacher rating. Therefore, it is important to note that the pen and paper group demonstrated the greatest number of differences (Roberts & Samuels, 1993).

The study suggests that the pen and paper method is superior to computer-based handwriting programs (Roberts & Samuels, 1993). However, the authors warn that the sample size of this study was small, and that its results cannot be generalized. Regardless, it starts an important conversation on the format of handwriting remediation. Teachers who want to expose their students to more technology might see a computer-based program for handwriting as a possible alternative. Rather than replacing handwriting with technology, technology and handwriting could be used in combination.
A different vision for the future of technology involves the use of keyboarding as a replacement for handwriting. Researchers examined the technology-related recommendations made by occupational therapists for school-aged children and the factors that influence these recommendations. The participants in the study were occupational therapists, who were members of the Canadian Association of Occupational Therapists and had indicated working with school-aged children. Each therapist was sent a survey. The survey consisted of a variety of question types (including multiple choice and a rating scale) that discussed three main topics of interest: therapist demographics, technology strategies recommended, and factors influencing recommendations. Of the 1468 therapists who were sent a survey, 443 of the surveys were usable (Freeman, MacKinnon, & Miller, 2004).

The survey found that most of the therapists (93%) recommend that students with handwriting problems complete “all or part of their work using keyboard strategies” (Freeman, MacKinnon, & Miller, 2004, pg. 154). The most common recommendations were a desktop computer (89%), a laptop computer (78%), and an alternate output device (65%). Out of the therapists who recommended a keyboard strategy, 85% recommended the use of more than one strategy. The most common factors influencing these recommendations were the cost/funding availability of the technology and the equipment availability (Freeman, MacKinnon, & Miller, 2004).

The most interesting part of this survey is that most Occupational Therapists recommend the use of a keyboard for students experiencing handwriting difficulties. Furthermore, therapists with more experience were more likely to recommend technology tools. On the other hand, many therapists recognize that the lack of keyboarding
competency is an obstacle to these students (Freeman, MacKinnon, & Miller, 2004). Since this study was a survey of Canadian therapists, its results should be interpreted with caution. Nonetheless, the widespread use of technology here for remediation cannot be understated. The authors suggest that occupational therapists need to be involved in the debate surrounding handwriting instruction in the classroom.

Occupational therapists should be involved in this debate and should work with teachers for the benefits of the students. One limitation of this study is that the teachers’ views on the technology recommendations were not addressed. Little to no research regarding technology’s impact on handwriting examines both the educator’s perspective and the therapist’s perspective. The educator and the therapist are not often viewed as working together, although research suggests the benefits of such a collaboration (Bazyk, Michaud, Goodman, Papp, Hawkins, & Welch, 2006).

From the studies reviewed, there is evidence that technology has an impact on handwriting skills, compositional skills, fine motor skills, and educational achievement. In order for the educator and the therapist to work together to address these issues, it is important that they understand each other’s perspectives. Few of the studies reviewed presented the perspective of an occupational therapist, and hardly any of them allowed for a comparison of these perspectives. Therefore, the purpose of the current study was to compare these perspectives by examining whether these professionals (teachers and therapists) believe that handwriting is still important for academic success and whether or not technology has impacted its relevance. The research questions guiding this study are as follows: “In the face of technological advances, how do teachers and occupational therapists view handwriting instruction?” “Do teachers and occupational therapists
believe that handwriting affects academic success?”, and “Do these professionals believe that good handwriting is important for success in the current society?”.  

Participants

The participants for the current study were elementary teachers, ranging from Kindergarten through sixth grade. Participants also included occupational therapists, who have worked with elementary aged students. Teachers from two school corporations in the mid west were sent surveys. Of these teachers, 13 of them responded and completed the survey. In addition, occupational therapists from the mid west were sent the survey. Of these, 8 of them responded and completed the survey.

Procedure

For this research, a survey was developed. The survey included six questions. Two of the questions asked participants to rate on a scale of one to ten, and the other four were short answer questions. The first questions asked participants to rate how important handwriting instruction is for primary grade students (K–2) (One = not all important; Ten = very important). The second question with a scale asked participants to rate how handwriting affects academic success for primary grade students (One = has no effect; Ten = has great effect). The short answer questions were as follows: “Do you believe that good handwriting skills are necessary for success in current society? Why? Please explain”, “Explain how you feel about technology and its impact on the handwriting skills of current primary grade students”, “Explain how you feel about technology and its impact on the fine motor skills of current primary grade students”, and “Have technological advancements affected the relevancy of handwriting instruction? Why or why not?”
The surveys were sent to the participants in two different ways. When possible, the participants were given a paper copy of the survey. At the top of the survey, the following paragraph was included: “Feel free to leave questions unanswered that you do not feel comfortable answering. Once you have completed the survey, please place the survey in the provided envelope. Envelope includes postage and a return address.” There was no place to put one’s name on the survey. Therefore, the survey was kept anonymous. Other participants received the same survey through a survey website. The procedures for this research received IRB approval.

Data Analysis

The data was analyzed using Microsoft Excel software. In the analyses, descriptive statistics (means and standard deviations) and frequencies were computed for this study. The data was then generated into pie charts and bar graphs.

Results

Descriptive statistics were computed to find out participants’ perceptions of the importance of handwriting instruction for primary grade students. On a scale of 1-10, the overall mean was 8.095, SD = 2.587. Both the teachers and occupational therapists perceived handwriting to be important (M= 8.00; SD= 2.77 and M= 8.25, SD= 2.43) respectively. An analysis of mean differences revealed no significant difference between the teachers’ and the therapists’ perceptions of the importance of handwriting for primary school students. See Table 1 and Figure 1 for details.

Table 1. Importance of Handwriting

<table>
<thead>
<tr>
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<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>8.00</td>
<td>2.77</td>
</tr>
<tr>
<td>Occupation therapists</td>
<td>8.25</td>
<td>2.43</td>
</tr>
</tbody>
</table>
Mean range: 1.00 -10.00
As Figure 1 shows, a majority (60%) of participants viewed handwriting to be important, while only a small percentage (5%) perceived handwriting to be less important for primary school students.

When asked how handwriting affects academic success for primary grade students, both teachers and occupational therapists agreed that handwriting does influence students' academic success (M = 7.238, SD = 2.528). Individual means showed that occupational therapists perceived the influence to be greater (M = 7.833, SD = 2.264) compared to the teachers (M = 6.538, SD = 2.504). See Table 2 and Figure 2 for details.

Table 2. Impact of Handwriting on Academic Success

<table>
<thead>
<tr>
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<th>Mean</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>6.538</td>
<td>2.504</td>
</tr>
<tr>
<td>Occupational Therapists</td>
<td>7.833</td>
<td>2.264</td>
</tr>
</tbody>
</table>

Mean range: 1.00 – 10.00
Question three asked participants whether they believed that good handwriting skills were necessary for success in current society. The responses were assessed and rated according to the following criteria: 1 = Yes, handwriting is necessary for success, 2 = Handwriting is somewhat necessary for success, and 3 = No, handwriting is not necessary for success. The overall mean for the necessity of handwriting was 1.524, SD = 0.68. See Table 3 for details. In terms of frequency, 12 of the participants said, “Yes”, 7 said “Somewhat”, and 2 said “No”. See Figure 3 for details.

Table 3. Handwriting and Success in Society

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>1.615</td>
<td>0.768</td>
</tr>
<tr>
<td>Occupational Therapists</td>
<td>1.375</td>
<td>0.517</td>
</tr>
</tbody>
</table>

1 = Yes; 2 = Somewhat; 3 = No
The reasons given by participants for why handwriting was necessary for success in society ranged from technological reliability to document signing. Three participants cited that technology would not always be available. One participated explained, “Yes. Despite the availability of technology, it is not always guaranteed to be working.” Another explained, “Yes. Necessary for note taking and writing in situations when a computer is not available. Provides the most options for individuals.” Three other participants cited practical reasons, including document signing, job requirements, and the impact of “day to day life”. Other reasons given included the use of handwriting to effectively communicate, to demonstrate understanding, and to reflect confidence.

Two participants stated that handwriting was not necessary for success in current society and gave reasons such as “there are not many careers where writing is a must”, and “letter writing is a thing of the past. It is so difficult to even read parent handwriting”. Both of the participants who said that handwriting was not necessary were teachers.

Question four asked participants to explain how technology impacts the handwriting skills of primary grade students. The participants responded with a variety of
answers. Five of the participants described the negative impact of too much technology exposure. In other words, these participants felt that handwriting skills are impacted because students are exposed to too much technology. For example, one teacher explained, “Over the last fifteen years, I have seen it become increasingly difficult for students to write neatly. I directly blame that reality on the fact that students are exposed to computer/device/phone screens way too often at too early an age.” In another response, a therapist explained, “Technology is overused. Kids have access at home and now at school, often as a time filler.”

Other responses discussed the negative impact technology has on handwriting skills. Six participants, who include five teachers and one therapist, discussed technology in a negative way. One teacher described technology as a “threat to good handwriting skills”. The teacher went on to explain, “I avoid technology at all costs when it interferes with the learning of handwriting.” As another teacher put it, “Technology is ruining good penmanship!” In contrast, only one participant discussed technology in a positive way, stating, “I think technology allows people to communicate effectively without needing great handwriting. Technology can also, however, help students develop their handwriting because there are many games and apps designed for writing.”

A few of the participants had mixed feelings regarding the impact of technology on handwriting skills. As one therapist wrote, “Students are using computers and i-pads more which is a great tool for communication. However, as a result they are having less exposure to paper/pencil writing and minimal to no time to spent on learning letter formation on other mechanics of writing.” Finally, two of the participants explained how
the impacts are seen more in the intermediate grades, since “My 1st graders still have to write”.

Figure 4 presents participants responses on the impact of technology on handwriting. As can be seen in the Figure, 32% saw technology as having a negative impact, 26% felt there was too much technology exposure, 16% had mixed feelings, 10% saw technology has having a greater impact on intermediate grades, and 5% saw technology as having a positive impact. In the other 11%, miscellaneous reasons were given. See Figure 4 for details.

Figure 4. Impact of Technology on Handwriting Skills

Question five asked participants to explain how technology has impacted the fine motor skills of primary grade students. Similar to question four, a variety of answers were given. Two of the participants reported the overexposure of technology, which was also mentioned in question four. Three participants explained that technology is not as beneficial as other activities (e.g. cutting with scissors) in terms of improving fine motor skills. For example, one therapist explained, “Pushing a button is not as beneficial as a
kid who does crafts, cuts, plays with play-dough, legos, etc. Technology is good but there are other hand and mind activities (that) need to be done too at home and at school.”

Along similar lines, three participants described how technology produces strong thumbs but fails to produce strong hand coordination. In the words of one teacher, “It has hurt the fine motor skills. They have strong thumbs for playing games but many can’t even hold a pencil.” Another teacher had a similar response, explaining, “Unless they are clicking with their thumbs students often have little or no coordination or strength in their hands.” Two participants described the impact of technology on the ability to perform self-care tasks (e.g. tying one’s shoes). Video games were also mentioned in this participant’s response: “We have many students that have the ability to control game controllers with great accuracy but have difficulty tying shoes, learning to write, zipping jackets, using scissors, etc.”

Four of the participants had seen a decline in fine motor skills but did not solely blame technology. One teacher described how the “current students’ fine motor skills are deficient.” The teacher continued to explain, “But most of my previous class were also deficient. I’m not sure this is because of technology.” One teacher put some of the blame on the standardization movement, writing, “Technology is hurting fine motor skills, but so are standards that don’t allow students to sit and color, cut, and paste. These ‘crafty’ projects that legislators think are a waste of time, are crucial in helping master fine motor skills.” Finally, in response to this question, one participant called for keyboarding skills to be taught, explaining that “any and all technology instruction is warranted: it’s not going anywhere.” See Figure 5 for summaries of responses to question five.
As Figure 5 shows, 23% of participants felt that fine motor skills are impacted by factors other than technology, 18% regard technology as less beneficial for fine motor skills than other activities, 17% credited technology with the development of strong thumbs but weak hands, 12% described the impact of technology on self-care tasks, 12% described the overexposure of technology, 12% gave miscellaneous reasons, and 6% reported that keyboarding skills should be taught in the elementary curriculum.

Figure 5. Impact of Technology on Fine Motor Skills

Finally, question six asked participants to explain whether or not technology has impacted the relevancy of handwriting instruction. The responses were assessed and rated according to the following criteria: 1 = Handwriting instruction is still relevant, 2 = Handwriting instruction is less relevant, and 3 = Handwriting instruction is irrelevant. As Figure 6 shows, a majority of participants viewed handwriting instruction as still relevant. See Figure 6 for details.
Participants who said that handwriting instruction is still relevant gave several reasons. Some pointed to the unreliability of technology, stating that “I know that sometimes it (technology) stops working. You have to be able to fall back on older methods when that happens.” Another participant described handwriting and technology as two different skills, explaining, “Technology use and handwriting are two different skills, both important; however, one should not take the place of another.”

For those participants who said that handwriting is less relevant, three discussed the different modes of communication. As one wrote, “I do think there is less of a need to have good and legible handwriting because more of how we communicate in writing as a society is occurring on electronics.” Two participants, one a teacher and one a therapist, cited the prevalent testing as a reason. As the therapist described, “Teachers have more demands on them for testing and less time devoted to teaching handwriting.”
Discussion

The participants in this study acknowledged the importance of handwriting instruction. This data shows how these professionals valued handwriting instruction and viewed it as important. More than half of the participants rated handwriting as "very important". When the teachers and the therapists are analyzed separately, no significant differences are found. Therefore, these two professions valued handwriting instruction similarly. These views are supported by research, which suggests that handwriting instruction is an important part of the elementary curriculum (Graham, Harris & Fink, 2000).

In this study, more participants thought that handwriting instruction is important than those who think that it is necessary for academic success. Therefore, several of these professionals saw the value in handwriting apart from its contribution to academic achievement. There was a difference between the therapists and the teachers in this regard. Interestingly, although the teachers would have more control over the child's academic success compared to the therapists, the therapists saw handwriting as a bigger contributor to student success. A possible explanation is that teachers are unaware of the way that the handwriting of their students' work can affect their evaluation (Markham, 1976). Another possible explanation is that the therapists have less control over what happens in the child's classroom and see handwriting as the most important way in which they can help a child succeed. Nonetheless, research does suggest that handwriting impacts educational achievement throughout the college years (Connelly, Dockrell & Barnett, 2005).
More participants in this study viewed handwriting as necessary for success in society than those who saw it as important for success within the classroom. The data shows that therapists saw handwriting as more necessary for success than did teachers. Therefore, according to this data, therapists saw handwriting as a bigger contribution to success both inside and outside of the classroom than did teachers.

In terms of technology's impact on handwriting skills, these professionals saw more harm than good when it comes to technology's impact on handwriting skills. The participants also identified the amount of exposure children have to technology as a problem. Both teachers (3 total) and therapists (4 total) acknowledged this problem. The level of technology exposure in the current society was clearly a concern for these professionals. This concern over the quantity of time spent using technology resonates with research. Spending high quantities of time on technology does not positively correlate with a child's cognitive development (Li & Atkins, 2004). Furthermore, it seems that these professionals are concerned with the amount of time children spend playing video games. Although video games were not mentioned in the survey or in any prompt, four of the participants discussed the impact of video games and/or the prevalent use of video game controllers. Unlike technology use in the classroom, this type of use of technology would be mostly out of a teacher's or a therapist's control.

Some of the participants acknowledged a deficit in fine motor skills but did not see technology as the main root of the problem. Interestingly, no other reasons were given for a deficit in handwriting skills. Therefore, some of the professionals viewed handwriting skills as more directly impacted by technology, while fine motor skills are
impacted by a wider variety of factors. Finally, there was no significant difference found between the teacher and the therapist in terms of the relevancy of handwriting instruction.

Conclusion

It is clear that a majority of these professionals viewed handwriting as important, specifically when it comes to handwriting instruction. Both teachers and therapists want handwriting instruction in the classroom and do not view it as irrelevant due to technology. This aligns with the study’s proposed hypothesis. In terms of technology’s impact on the child’s success, both within the classroom and within society, it seems that therapists perceived a larger impact. Nonetheless, a majority of these professionals (both teachers and therapists) viewed handwriting as having a great effect or a moderate effect on a child’s academic success. Similarly, a majority felt that handwriting is necessary or somewhat necessary for success in current society.

There were some unexpected themes that emerged from the study. Within the responses for technology’s impact on handwriting skills and fine motor skills, both teachers and therapists discussed the outside pressures to disregard handwriting instruction, due to the time constraints caused by standardized testing and the current curriculum movement. Research has echoed similar feelings about these curriculum trends (Jones & Christensen, 1999). These professionals also expressed their concerns for the whole child, by discussing the overexposure of technology and its negative effects. Overall, these professionals valued handwriting and its instruction.

Limitations

There were several limitations to this study. The study is based on a small sample size. Therefore, one must be cautious in using the results of this study to generalize to all
teachers and therapists. Another limitation of the study is the lack of demographic information for the participants. The participants' age, gender, race, or years of practice were not obtained. If this study was replicated, obtaining this information would be encouraged. One may rightfully wonder if a younger teacher would perceive handwriting differently than an older teacher would. The following quote from a therapist may ease these concerns: "They (kids) don't have the practice with fine motor skills...So many areas that in the past have been taught with hands on learning are now being "taught" with technology. I know I may sound like an older therapist but I'm not even 30 and seeing a huge difference in how kids are interacting with the world and spending their down time and frankly it scares me. Kids don't move, their eyes are being strained, and their brains can't process HOW to do many basic skills because they are not practiced."

Implications

Although the majority of these professionals view handwriting as important, there are still discrepancies. Although many rated the importance of handwriting instruction high (a ten), one therapist rated it as a three, and one teacher rated it as a four. Therefore, it is important that the impact of handwriting on a child's success continue to be researched, so that these professionals can reach a consensus on what is best for the students.

This study also points out another way in which teachers experience pressure from standardized tests to change their teaching and remove the "unneeded" content from the curriculum. Since these professionals view handwriting as relevant, it appears that handwriting instruction should stay within the curriculum. It will take dedicated and
intentional teachers to teach what they know the students need, in the face of outside pressure.

An important part of this study was the inclusion of both the teacher and the therapist. By studying their perceptions about handwriting together, this study acknowledges the fact that they often work with the same students. For the benefit of the students, it is most helpful if the teacher and the therapist are on the same page and can collaborate together. More studies should be conducted that explore both of these distinct, but related professions.

Finally, this study continues the discussion on the use of technology within the classroom. Although the impact of technology can be discussed in a variety of ways, technology's impact on handwriting skills, fine motor skills, and the relevance of handwriting instruction was researched in this study. With the continued introduction of technology into the classroom, it is important that new skills are introduced without the loss of "old" skills. As one teacher put it, "Technology use and handwriting are two different skills, both important: however, one should not take the place of another."

Teachers, therapists, administrators, researchers, and other professionals will need to determine which skills are most important for students to learn, so that all can work together to best prepare students and provide them with the most opportunity.
References


Jones, D., & Christensen, C. A. (1999). Relationship between automaticity in handwriting and students' ability to generate written text. *Journal of Educational Psychology, 91*(1), 44.


Proceedings of the 15th international conference on Human-computer interaction with mobile devices and services.
Project Overview

[667983-1] Elementary School Teachers' and Occupational Therapists' Perceptions of Student Handwriting

You have Full access to this project.

Research Institution: Ball State University, Muncie, IN

Title: Elementary School Teachers' and Occupational Therapists' Perceptions of Student Handwriting

Principal Investigator: Horstmeyer, Hannah

The documents for this project can be accessed from the Designer.

Project Status as of: 04/14/2015

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Package 667983-1 is: Locked - Revisions Complete

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