

Cursive Handwriting in an Internet Age

Karen Armstrong

Abstract—Recent concerns about the value of teaching cursive handwriting in the classroom are based on the belief that cursive handwriting or penmanship is an outdated and unnecessary skill in today's online world. The discussion of this issue begins with a description of current initiatives to eliminate handwriting instruction in schools. This is followed by a brief history of cursive writing through the ages. Next considered is a description of its benefits as a preliminary process for younger children as compared with immediate instruction in keyboarding, particularly in the areas of vision, cognition, motor skills and automatic fluency. Also considered, is cursive's companion, paper itself, and the impact of a paperless, "screen and keyboard" environment. The discussion concludes with a consideration of the unique contributions of cursive and keyboarding as written forms of communication, along with their respective surfaces, paper and screen. Finally, an assessment of the practical utility of each skill is followed by an informal assessment of what is lost and what remains as we move from a predominantly paper and pen world of handwriting to texting and keyboarding in an environment of screens.

Keywords—Asemic writing, cursive, handwriting, keyboarding, paper.

I. INTRODUCTION

WRITTEN communication is essential in our world. Whether through cursive writing, or keyboarding and texting, we need a means of both being--and staying--in touch when we are not interacting face to face. As well, we rely on written communication in other ways. Perhaps we use it only as a way to remind ourselves briefly of important information such as a date or appointment or as a record of what has taken place. At the opposite extreme, most of our legal documents, such as wedding, and birth certificates exist in a paper form. Thus—at whatever level--whether it be cursive or keyboarding, written communication is essential. However, the teaching of cursive writing/handwriting/printing (henceforth referred to as "cursive") in our schools has been increasingly called into question.

Supon is not the first to wonder: "Cursive writing: are its last days approaching?" [1]. Bennett compares penmanship to hieroglyphics and the use of the IBM selectric typewriter, concluding with the proposal, "let's erase it for good" [2]. Amos [3] reports that "at least 41 states do not require public schools to teach cursive reading or writing." Cross [4] too, observes "schools saying goodbye to cursive writing". And the author of the K5 learning blog [5] succinctly proposes, "like calligraphy, we are past cursive writing."

A vivid example of today's current 'crisis' was a startling revelation in the Trayvon Martin case of 2014. The star

witness, Rachel Jeantel, stated that she could not read the handwritten cursive script that she apparently wrote to Mr. Martin's mother. The letter detailed what Ms. Jeantel allegedly heard while on the phone with the late Mr. Martin moments before he was fatally shot by 29-year-old defendant George Zimmerman. Though she studied the page at length, Ms. Jeantel could not, in fact, read one word she had written, apart from her own name, the date, and the words "thank you." In explaining her difficulties, Ms. Jeantel, a 19-year-old senior at Miami Norland High School, claimed, "I can't read cursive." This was despite the fact that she had written the note herself [6]. Although in a legal trial, this lack of ability to read what one has written is lamentable, the phenomenon of illegible handwriting has always been a problem. Even today, on the Graduate Medical School admission test, the administrators make clear that legibility in handwriting is essential: "It is very important that your handwriting is clear and distinct. You will disadvantage yourself in Section II if your writing is illegible. Please click on the link below to see examples of illegible handwriting" [7]. When one clicks on the link, no fewer than four examples of almost unreadable handwriting are provided [8]. It is almost painful to look at these scribbles but of course, the occasional word is legible, i.e. "development" or "students". Interestingly, completely indiscipherable handwriting is now an emerging art form. It has been given the name: "asemic" writing and is defined as "a wordless open semantic form of writing. The word, "asemic" means "having no specific semantic content". With the absence of semantic content, the ensuing vacuum of meaning is left for the reader to fill in and interpret, similar to the way one would deduce meaning from an abstract work of art." ...true asemic writing occurs when the creator of the asemic piece, cannot read their own script or handwriting" [9].

When essay exams used to be handwritten, and occasionally, when students had no idea about what to say for a particular answer, they would often write illegibly, hoping that the examiner would believe they were writing something of value, thus providing a rather pragmatic precursor of this style of handwriting. However, a specific recent and respected example of asemic writing is Luigi Serafini's *Codex Seraphinianus* [10]. Serafini described the script of the *Codex* as "asemic" in a talk at the Oxford University Society of Bibliophiles held on May 8, 2009. Even though illegible writing is recognized as an influence on asemic writing, it is significant that "instead of being thought of as a mimicry of preliterate expression, it has been proposed that asemic writing may be considered to be a postliterate style of writing that uses all forms of creativity for inspiration [9]. Putting aside the issue and consequent art form of asemic scribbles [11]-[13], Owens [14], amongst others, laments that students today cannot even sign their own names because they have "no idea

K. Armstrong is in the Faculty of Education at York University in Toronto Ontario, Canada (phone: 647-297-4485; email karmstrong@edu.yorku.ca).

how to write in cursive”.

Thus, even if we disregard the ability to produce cursive writing, the perhaps equally lamentable inability to read even beautifully scripted cursive handwriting is also perceived by many as an important loss. Perhaps even more saddening and puzzling however, is the fact that we have many amongst us, who write something down to remember it and then, often, due to issues of legibility, which has been exacerbated by constant keyboarding and little handwriting [15], cannot read even their very own handwriting, thus reducing or elevating our production to aseptic scribbles similar to Jeantel's handwritten note in the Trayvon Martin case. Is this a loss? Should we be concerned? What does it mean to write and then be unable to read it? What are the implications for us as individuals and for our society? This paper considers the problem. But first, the discussion turns to the very roots of written communication. Where and how did this need to communicate through writing, begin?

II. A HISTORY OF CURSIVE

A history of cursive must begin with a history of writing itself. The history of writing is primarily the development of expressing language by letters or other marks and also the study and description of these developments. The major writing systems fall into roughly four categories: logographic, syllabic, alphabetic, and featural [16]. Although there were earlier systems of communication, true writing, in which the content is a verbal utterance encoded so that another reader can reconstruct it with a fair degree of accuracy, is a later development. Interestingly, writing numbers for the purpose of record keeping--in particular related to economic transactions--began long before the writing of language and was surely instrumental in the move to transcribe language and write words. Indeed, it is generally agreed that true writing of language (not only numbers) was invented independently in at least two places: Mesopotamia around 3600 BC and Mesoamerica, around 600 BC. In these early times, stone tablets were used as paper was not invented until 206 BC-220 AD [16].

Cursive handwriting developed into something approximating its current form from the 17th century, but its use was neither uniform, nor standardized, either in England itself or elsewhere in the British Empire. Perhaps the most comprehensive and vividly illustrated documentation of print letters and cursive handwriting instruction in the early twentieth century is Rosemary Sassoon's *Marion Richardson: her life and contribution to handwriting* [17].

It is interesting to reflect that the word “cursive” actually derives from the late 18th century. It comes from medieval Latin *cursivus*, from Latin *curs-* 'run', and from the verb *currere* [18]. According to the Oxford English Dictionary [19], cursive is an adjective meaning “written with the characters joined”. In this paper, we will be focusing on English and not considering languages such as Greek, Roman, Arabic or Bengali, to name only a few languages whose written forms are in a cursive format.

Within the English language, cursive writing is also known

as “script, joined-up writing, joint writing, running writing, or handwriting is any style of penmanship in which the symbols of the language are written in a conjoined and/or flowing manner, generally for the purpose of making writing faster.” Cursive is distinct from printing, in which the letters of a word are unconnected and in Roman/Gothic letter form rather than joined-up script. This style may also be called “printscript”, “print writing”, “block writing” (and sometimes simply “print”) [18]. Generally however, for purposes of this paper, we are considering written communication which is done by hand, using a pencil or pen, rather than keyboard or machine and thus, printing is as relevant as cursive writing, as both use paper or a tangible surface rather than a screen.

The origin of the cursive method is associated with the quill pen. In fact, it is interesting that “the writing instrument that dominated for the longest period in history (over one-thousand years) was the quill pen” [20]. Its very strengths and limitations strongly influenced cursive handwriting as it offered practical advantages of writing speed and infrequent pen lifting to accommodate the limitations of the quill pen: “quills are fragile, easily broken, and will spatter unless used properly. Steel dip pens followed quills; they were sturdier, but still had some limitations.” [20]

Generally, with regard to the instruction of handwriting, correct form was emphasized [20]. Dougherty [21] posits five different periods in the evolution of handwriting instruction. The first, from 1600-1800 so highly esteemed the acquisition of writing skill that “it was common to have schools devoted solely to the purpose of teaching this skill. In spite of many handicaps of material and method, Wickersham says that handwriting was better taught than most subjects [21]. Quill pens and birch bark paper were the predominant tools. During the second period, from 1800 to 1850, there was a reorganization of how handwriting was taught and steel pens superseded goose quills and lead pencils the plummet. During the period 1850-1890, fundamental questions with regard to the teaching of handwriting were raised. Method of teaching, styles of writing, hand and body positions and even desks were each taken into account and evaluated. The fourth period, from 1890-1900, was the vertical writing movement, based on “superior hygienic considerations”. Next, from 1900-1916 a combination of commercial and scientific influences predominated in response to the demand for “efficiency in writing in both speed and form. The use of drills necessitated many sheets of paper and the demand for speed resulted in a simplified form of the letters with the elimination of all non-essentials.” [21].

Throughout our discussion, it must be acknowledged that, in a very literal sense, writing is technology itself, for “without the crayon or the stylus or the laptop, writing is simply not possible” [22]. However, the pen, the printing press, the computer and the mobile phone are all technological developments, which have substantially altered written communication, and each has had an impact as well, on the medium through which the written word is produced. Now, not only can actual characters can be formed by the press of a keys on a keyboard, rather than making the physical motion

with the hand, but in addition, when composing on an iPhone or computer, the writer has access to shortcut keys for entire words and phrases. In order to further increase speed, there is the Dvorjak method of keyboarding which is a much faster alternative to the QWERTY keyboard and consists of the flick of a switch on any keyboard so that the letters now have new positions which the user must memorize and then become proficient at using but which is a method designed for greater speed than the QWERTY keyboard which was actually designed in the 1870s by Christopher Latham Sholes to impede speed in order not to risk jamming the keys of the keyboard [23]. It is also worth noting that the cut-copy-paste function has dramatically simplified and advanced the world of composition from the world of handwritten papers in which analogous composing functions were laborious and needed to be completed by either erasure or white-out or taking the time to re-write by hand.

Furthermore, aside from the history of writing implements and materials, the nature of written communication has evolved over time to make way for an informal, colloquial written style, where writing more closely approximates oral conversation. Today, written communication can now be delivered with minimal time delay through email and short message service (SMS), and in some cases—with an imperceptible time delay—through instant messaging. Thus, these new writing technologies and tools have effected change not only in the appearance of the words we write but also the formality, elaboration and precision of our messages. It is important to acknowledge that, as such technologies develop and become more prevalent, and as our use of written language itself evolves to become less formal and much more like texting or oral conversation, we become further and further removed from paper and cursive handwriting as a popular way to communicate. It is not surprising that so many people consider handwriting (and thus paper) obsolete—not to add environmentally wasteful—and thus no longer essential skills to be mastered in schools. It is an anachronism to many people that paper thank you notes or paper invitations exist at all. When they are used, they mark either extraordinarily special or formal occasions such as weddings and bar mitzvahs.

Although the growth of multimedia literacy can be seen as the first steps toward a postliterate society [24], how precisely has this happened? How has writing instruction transformed itself from learning how to write each letter of the alphabet in cursive on paper, to keyboard strokes? Specifically, how did computers infiltrate instruction in the schools?

III. WRITING AND COMPUTERS

In the mid-seventies, cursive instruction was entrenched in education. It was during this decade, however, that computers began to be donated and used in schools worldwide [25]. It is interesting to note that this gesture of giving computers to schools was neither fair nor standardized, but in 1990, multimedia PCs were developed; schools generally began using videodiscs; and object-oriented multimedia authoring tools came into wide use. Simulations, educational databases

and other types of Computer Aided Instruction (CAI) programs were now being delivered on CD-ROM disks, many with animation and sound". In 1994, digital video, virtual reality, and 3-D systems captured the attention of many and object-oriented authoring systems such as HyperCard, Hyperstudio, and Authorware grew in popularity in schools. As well, significant to the current discussion, many classrooms worldwide now had at least one PC available for instructional delivery [25].

During the years 1997-2000, Internet use became more prevalent than had been predicted. The World Wide Web soon became the world's largest database of information, graphics, and streaming video, making it an invaluable resource for educators. However, its success was not without significant challenges. Marketing-oriented web pages, computer viruses hidden within downloadable programs and/or graphics, and spam (widely disseminated email-based sales pitches) threatened its viability in schools. However, progress continued rapidly. Search engines, such as Google and Yahoo, were in a state of continuous development and improvement. It seemed that there were always new ways to find information within the ever-growing number of web pages. During this period, web sites that offered individuals a place to put personal information became popular, as did internet-based publishing and discussion forums. Voice recognition software slowly entered the computing mainstream, but its development was slowed by an unacceptable frequency of errors. Educational software became more useful and interesting to students as graphics and video were incorporated. Finally, larger computer storage capacity and the growing prevalence of CD-ROM and DVD drives in personal computers made it easier for educators to store large graphic and video and sound files for educational applications [26]. So things were changing rapidly in schools due to the changing technology. When students of all ages started to explore the World Wide Web for the very first time in the classroom, under the watching eyes of teachers, these educators at the time were both very relieved and amazed to discover that—at least in these early days—the internet was heavily reliant on the reading of words rather than images. In this relatively early period, the exploration of internet was primarily a print literacy skill. Visual and image based literacy were still not fully developed. At the time, many had been preoccupied with the dangers of the internet in terms of safety for students and the need to block many websites.

With regard to the more prevalent stand-alone computers in classrooms, these were used primarily for drills and computer games to facilitate learning as late as 1986 [26]. However, with the rising popularity of the internet as well as the eagerness of schools to have their students become fluent in tools of emerging technologies, pressure from parents to have schools be relevant or preferably cutting edge, the curriculum began to focus on prioritizing new over "old". Not surprisingly, less and less time was devoted to teaching cursive in favor of the push toward making students fluent in new technologies which favored keyboarding rather than handwriting. It is true that learning letters and printing—along

with its closer relation to the way the actual keyboard presented and made letters—remained important for younger children. But instruction in cursive writing seemed to be losing its centrality in light of new technologies and electronic forms of communication. As a consequence, teachers colleges devoted less and less time at all to the rigors of legible writing or the teaching of it.

But related to these two different modes of written communication, there are other dimensions to be considered. Cursive writing or print is usually done on paper and is thus portable. To an extent, it is also “permanent” in a way that screen writing, with the ease of the delete key, is not. But this is only to an extent, of course, as paper can be lost or destroyed. However, the potential of permanence and portability of paper documents can be assets. Screen writing is not considered a tangible object unless it is as a screen tablet. Screen texts can be stored in files, deleted in an instant, copied, pasted into other texts, moved, sent around the world, and translated into over seventy languages, but they are less easily transported by hand, even though “saving” is part of the online world. One only has to attempt to write a grocery list on screen. Of course, it can be done, but one must turn on the electronic device by either logging in or starting a program. By comparison, writing a grocery list on a sheet of paper seems both effortless and elegant: no connectivity is required. Unlike writing on screen, creating a grocery list on a sheet of paper can be done in remote locations, not accessible by WiFi, folded and put in one’s pocket for immediate access regardless of connectivity issues.

Legal documents are often stored in safes, like bank notes. Although one can submit an offer to purchase a home online, the deed is hard copy and on paper. Although factums in law tend to be written on computer, according to an interview with one Toronto criminal lawyer [27], even these are printed off and changes recorded on the paper copy and then incorporated rather than using the track changes function electronically. As well, interview notes with clients are invariably handwritten so that the client can see and thus confirm that what is written is what he or she is saying. In this instance, handwriting is an important tangible demonstration of trust and accuracy. In medicine as well, cursive handwriting is essential in writing prescriptions. Some doctors take notes about patients on computers whereas others still use handwriting. From another informal interview with a Vancouver Emergency Room physician [28], it seems that in medicine, both paper and electronic documents are incorporated for record keeping: in some hospitals, nurses make observations by hand on a paper chart. However, these are often scanned so there are digital versions of the handwritten notes. As well, although prescriptions are often written by hand, in other cases they are produced electronically and then only signed by a physician. As for paper records and digitizing patient files in the medical world, both are currently possibilities to be considered with their respective strengths and vulnerabilities.

IV. HOW DO WE LEARN TO WRITE

Learning about the history of writing through the age of

mankind is interesting and useful but this history needs to be supplemented by an exploration of the history of writing through the age of each separate individual as we emerge from infancy to childhood and through to adulthood. After all, our experience as writers is personal and developmental—indeed it is a process, which many of us remember as a rite of passage toward becoming literate. However, as the beginning comments of this paper suggest, this practice may be vanishing. Importantly, despite this recent phenomenon, the development of literacy is an increasing priority worldwide.

The concept of literacy is defined in virtually all dictionaries-- from the Oxford English Dictionary to Google, as “the ability to read and write” [29]-[32]. Before examining the value of learning cursive or handwriting before keyboarding, we will spend a moment exploring the general importance and prevalence of literacy, or the ability to read and write, which Rachel Jeantel [6], amongst many of us, seem to be losing, at least when it comes to deciphering the meaning of handwritten letters.

As long ago as the late 1980’s, it was reported that “the world has experienced an education explosion...world enrolments at all levels of education, from the primary to the tertiary, expanded from about 250 million in 1950 to 906 million in 1985...more than half of the population of the age group 6-24 in the world are presently in schools and colleges...between 1960 and 1985...adult literates in the world doubled from 1,134 million to 2,314 million...” [33]. Of his review of research current at the time, Tilak [33] concluded that education (and the emphasis is on primary education or basic literacy) is the key to a country’s prosperity. Education contributes significantly to economic growth; as well, it is significant in reducing poverty. This relationship has become an increasing concern since that time. In 2011, *The Globe and Mail* reported that 84% of the world population can read but nonetheless, there are still 775 million, the remaining 16%, who cannot read [34]. The crucial importance of this ‘plight’ is reflected in the well-being and prosperity of both individual, as well as national survival. Bruce goes so far as to observe that “it is as hard...to imagine what it’s like to be illiterate as it is to imagine what it’s like to be mute, blind, and deaf. Being illiterate must be life imprisonment in a dark hole” [35]. Literacy has become almost a “necessity”. However, it is not a constant but a moving criteria which changes and becomes more difficult to achieve over time. One need only look at how the UNESCO definition of literacy has changed over time.

In Victorian England, literacy was defined as “the ability to sign the marriage register” [36]. In 1957, UNESCO defined literacy as no more than “the ability to read and write one’s own name” [37]. In 1983, the criteria of literacy had evolved to a person “who can with understanding both read and write a short simple statement on his everyday life” [38]. Today, UNESCO states that: “literacy is a fundamental human right and the foundation for lifelong learning. It is fully essential to social and human development in its ability to transform lives. For individuals, families, and societies alike, it is an instrument of empowerment to improve one’s health, one’s

income, and one's relationship with the world. The uses of literacy for the exchange of knowledge are constantly evolving, along with advances in technology. From the Internet to text messaging, the increasing availability of communication makes for greater social and political participation" [39]. It is interesting that the range of formats specified in the UNESCO sentence is from "internet to text messaging" rather than from internet to pen and paper. However, despite these significant changes in the mere definition of literacy standards over time, do we still need to learn how to form letters by hand? Or—as is inadvertently suggested by the UNESCO statement—have the omnipresent screen and keyboarding replaced the need for handwriting instruction?

Certainly, there is much research on the way in which keyboarding has improved the composing process and the final product of writing due largely to the cut-copy and paste functions. However, moving back a step, we will take a moment to examine the contrasting processes of how and when children are taught printing or cursive writing and how and when they are taught keyboarding skills. This is especially important since the keyboard communication seems to be eclipsing pen and paper communication. First, because the handspan of younger children is smaller than an adult's, instruction in efficient keyboarding generally takes place at around the age of ten years of age; whereas instruction in handwriting or printing is not thus restricted by any external device and a pencil or pen can be held by even a very young child [40].

Interestingly, the three stages of motor learning for keyboarding and handwriting are similar and yet—a crucial point—due to motor skill development and hand size, these quite different writing skills usually occur at different times in the development of the individual [41].

The first stage of both processes involves cognition and the use of vision. With regard to learning handwriting or printing at about five years of age, the teacher identifies letters for the students and describes the formation of strokes. In keyboarding, around ages ten to twelve, the student participates in touch keyboarding instruction and identifies the letters and locates them on the keyboard.

The second stage of motor learning is developing motor performance. With regard to learning handwriting or penmanship, the five or six year old learns to trace letters with verbal stroke sequence and visual cues. The verbal cueing fades as the student gains mastery. As well, motor and cognitive challenges increase as the student's abilities develop and the student engages in meaningful practice to support skill development. During this phase, Klemm [42] explains, "learning cursive is an important tool for cognitive development, particularly in training the brain to learn 'functional specialization'—that is, the capacity for optimal efficiency. In the case of learning cursive writing, the brain develops functional specialization that integrates sensation, movement control, and cognition. Brain imaging studies reveal that multiple areas of brain become co-activated during the learning of cursive writing of pseudo-letters, as opposed to

typing or just visual practice... there is a spill-over benefit for thinking skills used in reading and writing. To write legible cursive, fine motor control is needed over the fingers." The writer needs to pay attention and think about what and how the task is being performed. It requires practice. "Brain imaging studies show that cursive activates areas of the brain that do not participate in keyboarding... The brain's "reading circuit" of linked regions that are activated during reading was activated during handwriting, but not during typing... (furthermore) writing letters in meaningful context, as opposed to just writing them as drawing objects, produced much more robust activation of many areas in both hemispheres [42]. Thus asemic writing will not yield the same results as meaningful writing.

However, what of the differences in neural activity between learning to print and learning cursive? According to Klemm [42], in learning to write by hand, even if it is just printing, the brain must attend to three different tasks: a) locate each stroke relative to other strokes; b) learn and remember appropriate size, slant of global form, and feature detail characteristic of each letter; and c) develop categorization skills. He goes on to point out that "cursive writing, compared to printing, is even more beneficial because the movement tasks are more demanding, the letters are less stereotypical, and the visual recognition requirements create a broader repertoire of letter representation." Finally, "cursive is also faster and more likely to engage students by providing a better sense of personal style and ownership." There are other benefits of the hand's unique relationship with the brain when it comes to composing thoughts and ideas: Berninger, a professor at the University of Washington, reported her study of children in grades two, four and six that revealed they wrote more words, faster, and expressed more ideas when writing essays by hand versus with a keyboard [43]. As well, "cursive writing helps train the brain to integrate visual, and tactile information, and fine motor dexterity. The benefits to brain development are similar to what happens when one learns to play a musical instrument. Thus, as Klemm [42] points out, "not everybody can afford music lessons or a computer or smartphone but most seem able to afford money to buy a pencil, pen and sheet of paper and thus with the ensuing neurological benefits of such simple tools are within the reach of everyone".

With keyboarding, on the other hand, the student of ten to twelve years uses the home keys of touch-typing and their hands locate letter from the home keys using good technique, in a process similar to learning fingering on a musical instrument such as a piano or recorder. During this period, muscle memory is developed for "finger excursions to related keys". In the third stage, there is gradual improvement toward automatic fluency.

During the third stage of learning handwriting, the now six to seven year old develops speed until the handwriting becomes fluent and automatic. With regard to keyboarding, the ten to twelve year old shows a gradual improvement in kinesthesia muscle memory for locating keys. S/he stops using vision to find keys and check for errors and increases speed with meaningful practice opportunities. Importantly, "in order

to be functional” the speed needs to be greater than handwriting speed [40].

So the question persists: is it beneficial to learn cursive handwriting or should we use printing and then just leap into keyboarding or just start with keyboarding? Klemm [42] explains that, “brain imaging studies reveal that multiple areas of brain become co-activated during the learning of cursive writing of pseudo-letters, as opposed to typing or just visual practice.” Furthermore, “during one study at Indiana University, researchers conducted brain scans on pre-literate 5-year olds before and after receiving different letter-learning instruction. In children who had practiced self-generated printing by hand, the neural activity was far more enhanced and “adult-like” than in those who had simply looked at letters. The brain’s “reading circuit” of linked regions that are activated during reading, was activated during hand writing, but not during typing. This lab has also demonstrated that writing letters in meaningful context, as opposed to just writing them as drawing objects, produced much more robust activation of many areas in both hemispheres.”[44]. Although there is a low to moderate correlation between handwriting speed and legibility to keyboarding speed, the correlations suggest good fine motor skills for handwriting facilitate keyboarding both in acquiring skills and speed, inter-relating the motor learning of handwriting skills to keyboarding skills [45].

V. PAPER VS. SCREEN REALITIES AND VALUES

Thus, comparing cursive handwriting, or even printing, with keyboarding seems like comparing apples and oranges. These are two different stages of development and the way we use pen and paper or keyboard is often almost completely distinct. For example, few make a shopping list by keyboarding items and fewer students send notes in class to each other using pen and paper: they are much more likely to text.

To speak developmentally, learning to use a pen or pencil to print and then develop cursive writing is best learned when the child is 6-8 years old. This careful manual instruction has benefits, which are distinct from keyboarding in terms of neural activity. Although it is an increasingly important skill as the world moves online, keyboarding skill seems to represent a second stage of development, as with learning to run being preceded by learning to walk. Importantly, the benefits of cursive are: the awareness of letters, words and, ironically considering that it was developed as a way to increase speed of transcription, additional time to think and be aware of what one is thinking as one writes by hand.

Ideally, learning to keyboard is a continuation of this earlier writing or composition skill and requires a broader hand span more suited to a slightly older student. (With regard to its association with paper, handwriting allows one to jot a note on a piece of paper rather than electronically and thus provides quicker access and later accessibility such as taking a shopping list from one’s pocket. As has been mentioned above, one does not need to login or turn on a screen which does not seem like much unless one is in a tremendous hurry. Messages on paper are thus more permanent and easily

accessible even when internet connection is not available. The challenge of legibility is one which is difficult to address. Although it is important to be focused on process, if that is all there is to handwriting, it is of scant use.)

VI. CONCLUSION

Thus, the benefits of keyboarding are: fluency, speed, legibility, composition and quality of writing process in terms of copying and pasting pervasiveness of screen for everything from job applications through to housing transactions. Along with the ease of copying and pasting and effortlessly forwarding what we write to others, keyboarding also has the consequent possibility of being more public and accessible to others, thus invading our sense of privacy. In the days of paper and pen, it was more difficult to duplicate our handwritten messages unless one scans them on a computer. But what of those children who learn to keyboard and learn that skill alone? What is lost? Perhaps, paradoxically, the only loss is the additional time for deliberation as one is composing. And the only permanent change for those who are using screens not only predominantly, but exclusively, is the decrease in legibility of their handwriting. Thus, it is still hard to believe the plight of the witness in the Trayvon Martin court case, unable to make out even one word of her handwritten message. But it is easy to understand.

In conclusion, is it beneficial for schools to teach cursive or not? As with most such issues, the answer is somewhat subjective. But—because of the increased neural activity taking place during cursive writing; because it helps with later keyboarding skill and seems to ease the transition to learning keyboarding; because people may become doctors or lawyers where legible handwriting remains an essential part of the job; or even merely, because sometime a screen might now be available and only paper and pen are, it would seem important to persist and not let the skill be forgotten or undermined. Regardless of the outcry that cursive should be forgotten and eliminated from the curriculum; we will occasionally need to write something as mundane as a name, an address, or a shopping list. And thus have the information always available, without having to turn on a device, however prevalent they may become. Cursive writing is thus an important complement to our online communication.

REFERENCES

- [1] V. Supon, “Cursive writing: are its last days approaching? *Journal of instructional psychology*, 36, 4, pp. 357-361, 2009.
- [2] J. Bennett, “The curse of cursive: penmanship, like hieroglyphics and the IBM Selectric, has lost its purpose. Let’s erase it for good.” *Newsweek*, 153, 8, Feb 23, 2009.
- [3] D.S. Amos, “Is cursive’s day in the classroom done?” *USA Today*, Aug 12, 2013.
- [4] B. Cross, “Schools saying goodbye to cursive” *The Windsor Star*, A.5. 13 May 2013.
- [5] K5 learning blog, “Why do schools still teach cursive?” Retrieved August 29, 2014 from: <http://www.k5learning.com/blog/why-do-schools-still-teach-cursive-writing> n.d.
- [6] J.M. Crotty, “Rachel Jeantell, star witness in the Trayvon Martin murder trial cannot read her own letter: now whose fault is that? *Huffington Post* blog, June 28, 2013. Retrieved August 3, 2014 from:

- http://www.huffingtonpost.com/james-marshall-crotty/rachel-jeantel-star-witne_b_3519231.html
- [7] Graduate medical school admission test directions. Retrieved October 6, 2014 from: <http://gamsat.acer.edu.au/sit/handwriting-section-II>
- [8] Graduate medical school admission test directions: Bad handwriting samples. Retrieved October 6, 2014 from: http://gamsat.acer.edu.au/files/Bad_handwriting_samples.pdf
- [9] K. Johnson. When how it looks matters more than what it says. *New York Times*, November 22, 2013, C. 28.
- [10] L. Seraphini, *Codex Seraphinianus*. New York: Rizzoli, 2013.
- [11] M. Jacobson, Curator, "The new post-literate: a gallery of asemic writing." Retrieved August 18, 2014 from: <http://thenewpostliterate.blogspot.ca>
- [12] T. Gaze, *100 Scenes*. Transgressor Press, 2010.
- [13] T. Gaze & M. Jacobson, Eds, *An Anthology Of Asemic Handwriting*. Belgium: Uitgeverij, 2013.
- [14] E. Owens. Is cursive making a comeback? *The Daily Caller*, November 4, 2014. Retrieved November 23, 2014 from: <http://dailycaller.com/2014/11/04/is-cursive-really-making-a-comeback/>
- [15] R. Hamburgh. The lost art of handwriting. *The Guardian*. Aug 21, 2013. Retrieved November 23, 2014 from: <http://www.theguardian.com/lifeandstyle/2013/aug/21/lost-art-handwriting>
- [16] P.T. Daniels & W. Bright. Eds. *The world's writing systems*. Oxford, UK: Oxford University Press, 1996.
- [17] R. Sassoon. *Marion Richardson: her life and contribution to handwriting*. Intellect Ltd., 2011.
- [18] Online Etymological Dictionary. "Cursive", Retrieved November 21, 2014 from: <http://www.etymonline.com/index.php?term=cursive>.
- [19] Oxford English Dictionary. "Cursive", Retrieved April 30, 2014 from: <http://www.oxforddictionaries.com/definition/english/cursive>
- [20] M. Bellis, "A brief history of writing instruments". Retrieved August 15, 2014 from: <http://inventors.about.com/library/weekly/aa100197.htm>
- [21] *elementary school journal*, 18, 4, 280-286, 1917.
- [22] C. Haas, *Writing technology: studies on the materiality of literacy*. Mahweh, NJ: L. Erlbaum & Associates, 1996.
- [23] M.J. Ford & V. Poe. Microcomputer keyboarding skills: Dvorak vs qwerty. *Journal of computing in childhood education*, 3, 1, 73- 96, 1992.
- [24] D. Johnson. Librarians for a postliterate society. *Multimedia & internet@schools*, 16, 4, 20, July/Aug 2009.
- [25] A. Tatnall. & B. Davey. *Reflections on the history of computers in education*. IFIF Advances in information and communication technology, 424. 2014.
- [26] A. R. Molnar. Computers in education: a brief history. *T.H.E. Journal*, 24, 11, 1997. Retrieved November 21, 2014 from: <http://thejournal.com/Articles/1997/06/01/Computers-in-Education-A-Brief-History.aspx?Page=1>.
- [27] B. Eberdt, J.D. personal conversation, September 6, 2014.
- [28] C. Eberdt, M.D. personal conversation, October 7, 2014.
- [29] Oxford English Dictionary. Literacy. Retrieved October 12, 2014 from: <http://www.oxforddictionaries.com/definition/english/literacy>
- [30] Random House English Dictionary, Literacy. Retrieved, October 12, 2014 from: <http://dictionary.reference.com/browse/literacy>
- [31] Merriam-Webster English Dictionary. Literacy. Retrieved October 12, 2014 from: <http://www.merriam-webster.com/dictionary/literacy>
- [32] The Free Dictionary, Literacy. Retrieved October 12, 2014 from: <http://www.thefreedictionary.com/literacy>
- [33] J.B.G. Tilak, Education and its relation to economic growth, poverty and income distribution: past evidence and further analysis. World Bank Discussion paper #46, World Bank, Washington, 1989.
- [34] K. Hammer. Global rate of adult literacy 84% but 775 million still can't read. *Globe and Mail*, Sept 2, 2012. Retrieved October 5, 2014 from: <http://www.theglobeandmail.com/news/world/global-rate-of-adult-literacy-84-per-cent-but-775-million-people-still-cant-read/article4528932/>
- [35] H. Bruce, The dark hole of illiteracy. In *More than words can say*. Toronto: McClelland and Stewart.
- [36] R.D. Altick, *The English common reader: a social history of the mass reading public, 1800-1900*. Chicago: University of Chicago Press.
- [37] UNESCO. Discussion Papers. Washington, DC.: The World Bank.
- [38] UNESCO. Statistics of educational attainment and illiteracy. Paris: UNESCO, 1983.
- [39] UNESCO, Literacy. Retrieved October 5, 2014 from: <http://www.unesco.org/new/en/education/themes/educationbuildingblocks/literacy>.
- [40] N. C. Stevenson, C Just. In early education, why teach handwriting before keyboarding? *Early Childhood Education Journal*, 42, 49-56, 2014.
- [41] V. Connelly, D. Gee, & E. Walsh. A comparison of keyboarded and handwritten compositions and the relationship with transcription speeds. *British Journal of Educational Psychology*, 77, 2007, 479-492.
- [42] W. Klemm. What learning cursive does for your brain. In *Psychology today March, 2013*, Retrieved from: <http://www.psychologytoday.com/blog/memory-medic/201303/what-learning-cursive-does-your-brain>
- [43] Berninger, V. "Evidence-Based, Developmentally Appropriate Writing Skills K-5: Teaching the Orthographic Loop of Working Memory to Write Letters So Developing Writers Can Spell Words and Express Ideas." Presented at Handwriting in the 21st Century?: An Educational Summit, Washington, D.C., January 23, 2012.
- [44] M. Longcamp, M. Zerbato-Poudou, & J. Velay. The influence of writing practice on letter recognition in preschool children: A comparison between handwriting and typing, *Acta Psychologica*, 119, 2005, 67-79.
- [45] Rogers, J., & Case-Smith, J. (2002). Relationships between handwriting and keyboarding performance of the sixth-grade students. *The American Journal of Occupational therapy*, 73, 34-39.