

Using technology based devices to boost motivation when lettering by hand

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Abstract

The increased use of digital technologies to communicate using typing instead of handwriting has been attributed to the decline in handwritten communication. The paper argues that writing by hand is an essential skill to retain, with value beyond simply the technical ability to hand letter. Writing directly connects the hand to the brain and accesses the subconscious. Note taking by hand helps with memory and information retention. Free writing is therapeutic and unlocks creativity and using handheld tools improves manual dexterity.

Traditional approaches to improving handwriting typically involve repetition and continued practice. These methods, used extensively in education and skill-building exercises build muscle memory and knowledge. However, regular practice can be difficult to maintain, with motivation and also the increasing use of digital tools reducing the perceived need and desire to retain strong hand lettering skills. Motivation is a key factor, the repetitive nature of traditional approaches, such as writing drills requiring letters be written over again and again is often lost in increasingly digitally enabled, instant and interactive communication. In addition, the opportunities to create a handwriting habit are increasingly lost, as we have other ways to communicate.

The paper outlines current practice-led research exploring how to utilise and engage with digital technologies and tools to simulate a writing response rather than the typical typing response. Possible options to engage the learner are explored, to include, handwriting activities that comprise of practice in both conceptual and physical environments. Play theory using multi-sensory cursive writing apps for early education investigates how these apps use gamification, multi-sensory feedback and reward systems to engage young learners.

To then address multi-age, creative learners, exploring the use of pressure sensitive tablets and stylus to allow for the hand and brain connection to remain intact, as well as develop fine motor skills, along with building digital design tools competency with the addition of colour, brushes, pressure and layers typical to digital graphic design programs.

These devices are also portable, enabling practice anywhere at any time. And finally exploring the use of virtual reality and augmented reality, allowing for an immersive experience and full arm and body engagement to create letterforms. Applications, both educational and creative based, for HTC Vive and the iPad create diverse tools and techniques, engage with practicing letter forms in varied and multi-sensory ways, engaging with haptic learning and play theory to encourage hand lettering practice, to consider how and what that means in the digital era.

Technology has impacted dramatically on handwriting skills and a decline in manual dexterity, legibility and penmanship where keyboard and mouse input replaces the need to write by hand. Handwriting has many recorded benefits, and has been a primary communication tool for centuries, but a key driver for the research is countering the loss of fine motor skills and access to memory and the subconscious for creative expression that the act of handwriting allows. As digital technologies and tools redefine how we communicate, the loss of handwriting can be countered, through using technology as a solution, engaging with emerging tools for a truly immersive, skills building experience.

Keywords

Handwriting, cursive handwriting, repetition, practice, motor skills, technology experiment and play

Introduction

The definition of technology constantly evolves, to consider the historical context, we can trace a timeline of how we develop and use the latest technology over the centuries, and the effect this has on the way we communicate. Written communication can be traced back to the earliest written documents from 3150 BCE, with impressed clay tablets from Sumer, to Hieroglyphic writing on papyrus 1450 BCE, writing on animal skins 160 BCE; to Roman rustic writing with a flat pen, to manuscript books that are lettered in scriptoria (Carter, Rob; Meggs, Philip B.; Day, Ben; Maxa, Sandra; Sanders 2014).

The writing styles and medium of communication we use evolve as new technologies are invented and adopted. These innovations expanded over time, responding to wider societal and technological shifts such as the Industrial Revolution, to allow communication to a wider audience with the invention of woodblock printing, the printing press and moveable type. Each new era, heralded a fear of the loss of traditional skills and methods, such as the Calligrapher's unease when the typewriter was the new

technology, to the rapid change of communication with technological progress and the digital revolution (Carter, Rob; Meggs, Philip B.; Day, Ben; Maxa, Sandra; Sanders 2014).

As new technologies come to the fore, others remain but their emphasis and use can shift, to consider the rise of computer technologies it has irrevocably changed the way we use tools for written communication. Long, thoughtful and constructed handwritten letters compared to the quick emoji's in an instant text have different behaviours of communicating the message but it is communicating and connecting all the same.

Although the research in this paper is based on, investigates the decline of cursive handwriting at the hand of the latest technologies, it also encourages the adaption of innovative technologies, alongside embracing the importance of writing by hand. It is inevitable that technology will change the way we communicate. However, the disappearance of handwriting, especially cursive, will alter the way we live today, with handwritten communication and how we remember tomorrow, in regards to handwritten communication from previous generations, legal documents or special occasion certificates.

WHY HANDWRITING IS IMPORTANT

Developing the skill of writing letterforms does not equate to finding a letter on the keyboard to press (Burke 2014; Stevenson and Just 2012). Handwriting is a complex task that uses meta cognitive, memory and motor skills, connecting the mind and body to allow ideas to flow and be expressed quickly (Kučera 2010; Bara and Gentaz 2011). A key consideration is that our haptic senses are not activated to the same extent when using a keyboard, as they are when we write letterforms with pen and paper. Motor memory is engaged as we need first to visualise the letter before recreating it as opposed to simply seeing a letter and pressing it (Bara and Gentaz 2011).

Moreover, the sensory experience that our brain encounters when writing also helps to retain information more effectively as multi-sensory tasks strengthen the memory (Patchan and Puranik 2016). Visual memory skills use cognitive ability to recognise and then reproduce the complex content of the writing system (Waterman et al. 2014). The ability to communicate and develop these processing skills through technical drawing, sketching ideas and handwriting are achieved by exercising the visual motor memory that regular writing by hand facilitates (Mon-Williams et al. 2015).

Cursive handwriting is a beneficial literacy skill connecting the mind, body and spirit in the act of writing. The fluency of cursive allows for idea generation to flow freely as fewer pen lifts enable writing at a faster pace. Lawrence Burke (2015) suggests that ideas can be recorded quicker in cursive than when writing a manuscript in print style or when using a keyboard.

Besides retaining information and learning, there are additional benefits to writing by hand, such as psychologically, where calligraphy and handwriting can create a relaxed state (Yang et al. 2010). Calligraphy, which means beautiful handwriting (D'Angelo 1982), is expressive of our personality and our individuality, allowing for creative

expression. Once the involved letter components are studied, practiced and then mastered this will then allow for creative freedom. The skills required to execute these handwriting styles effectively are only achieved with practice and time allocated to learning the craft.

Communication is not only about the quick dissemination of information; it also involves expressing ourselves and with creative practice, creating a unique and original voice. Handwriting can be an effective way to represent who we are. By free writing or by streaming consciousness thought writing regularly, it is achieving direct access to our inner thoughts (Cameron 2002). It can be a therapeutic experience, as slowing down and taking the time to write by hand has been shown to have excellent mediation properties (Lomas et al. 2017). As technology changes the frequency of use and the perceived value of writing by hand, the loss of this skill and the benefits it provides need to be considered and valued.

“Language is the most intimately physically of all artistic mean. We have it palpably in our mouth; it is our langue, our tongue. Writing it, we shape it with our hands. Reading aloud what we have written - as we must do, if we are writing carefully - our language passes in at the eyes, out of the mouth, in at the ears; the words are immersed and steeped in the senses of the body before they make sense in the mind. They cannot make sense in the mind until they have made sense in the body. Does shaping one's words with one's own hands impart character and quality to them, as does speaking them with one's own tongue to the satisfaction of one's own ear?... I believe it does” (Burke 2015)

REPETITION AND PRACTICE IS THE KEY

As previously suggested, the reliance on the keyboard and a focus on technology for the use of the letterform creates a cause-and-effect scenario with the loss of the skill of handwriting. With the increasingly preferred method of learning and working via computers, such as paperless workplaces and schools (Robinson 2017), we are not writing enough to maintain the fundamental skills of legible cursive handwriting. A proven way to manage a fast and legible hand is by practicing on a daily basis. Handwriting instruction, consistent self evaluation, copying from letter models and using memory are all areas that will show improvement in the speed and legibility of handwriting (Santangelo and Graham 2016). This type of intervention has been identified as the most effective way to solve handwriting problems, as studies have found without practise little to no improvements are shown (Hoy, Egan, and Feder 2011).

To learn or to improve handwriting skills, one needs to practice the letterforms, through repetition, such as writing drills, copying and using memory, self-evaluation, to learn the technical skills of the letterforms. To be able to produce these letterforms instinctively and with ease we need to build muscle memory. The standard method to develop muscle memory is to repeat the letterform over and over again (Pfeiffer et al. 2015), for example, repeating a page of A's and B's and so on. This method of learning, (although useful, if using mindful practice), has the potential to lose the interest of the learner.

The Spencerian system of penmanship that was introduced by Platt R. Spencer, Sr. in the mid-1800's (Spencer Authors 1874), is a method of breaking down the letterform into separate elements to practice and learn, to then combine into letters. This process of looking at the components of the letter separately was thought to be an easier way to comprehend the letter structure. This method engages with and builds mental competency as well as physical competency, as the mind traces the exactness of the stroke before the hand moves to execute the stroke (Spencer Authors 1874). Once comfortable in mind, muscle memory then allows for the practice of the movement of the strokes and builds manual dexterity.

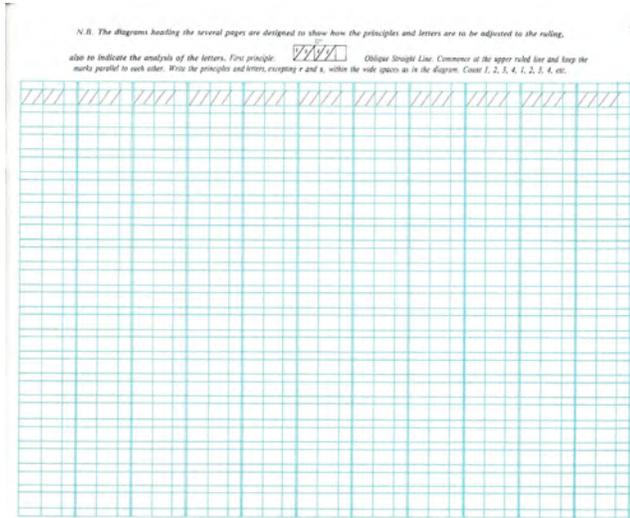


Figure 1. Theory of Spencerian Penmanship, Spencer Authors, 1874.

This process can seem tedious especially when presented with a copybook from the 1800's full of individual letters to be repeated over and over again. This method is proven as an incredibly effective way to learn the letterforms, as it is building muscle memory as the letters are repeated, however, if the student is not motivated by the passion of learning letters, the process can be perceived as monotonous. In an experiment the practice-led research this paper draws on found in a technology savvy demographic for example, the practice drills needed to be consistent of the correct letter formations studied in the copy book from the mid 1800's and introduced into new environments both traditional and digital, to encourage regular practice.

WHY WE FIND IT DIFFICULT TO PRACTICE

We live in a world where technology is at our fingertips and increasingly integrated into many aspects of our daily lives. From the use of smartphones to computers, access to knowledge is just a click away, and we, in turn, can share our experience at the press of a button. Although we are immersed in technology in our school, work, and home life, the basic skills of handwriting are essential to retain (Dinehart 2014).

Cursive handwriting has become a technique that is used less frequently; with the shifting to technology and input tools such as the keyboard (Wollscheid et al. 2016). A small pilot study was run, when it was discovered that my sixteen-year-old son was unable to read or write cursive handwriting effectively. It highlighted a larger area to investigate, that primary and secondary students may be losing essential skills that cursive handwriting fosters. These skills that are developed when practising cursive handwriting include the ability to process a combination of attributes ranging from intellectual psycho-motor activity to learning with the mind, body and spirit (Burke 2015).

To review this within an international context, over 80 percent of American schools have elected not to teach cursive reading or writing (Sindelar 2012; Wollscheid et al. 2016) In paperless schools, students are encouraged to use emails to send work back and forth from teacher to student. As a result, handwriting through the use of paper and pens is increasingly removed from the learning environment as worksheets are typed out using keyboards and sent back via email to the teacher (Le Strange 2017).

We are fully immersed in technology at every turn, with our minds stimulated with information overload at the press of a button. We have access to information immediately and at times perhaps overstimulated (Robson 2017). The slow practice of calligraphy can provide time out, a quiet moment, and a slower pace; a relaxing mediating time writing (Chen et al. 2018). However, if results are expected quickly, outcomes may not be evident or able to meet the expected time constraints, without first putting in the practice (Hoy, Egan, and Feder 2011).

With the abundance of technology at our fingertips, opportunities to create a writing habit are disappearing. I personally still hand write a daily list but I would be interested in the daily list of a digital native (Wollscheid et al. 2016). I would imagine the process would comprise of the latest organisation app like Wunderlist or Evernote. These apps are effective, but also a simple example of the changing the way we record even our smaller daily tasks such as a handwritten list.

To consider the contrast of writing well-planned, refined content for a handwritten letter, to the immediacy and constant connectedness of emails, text messages or social media interactions, the way we communicate has changed and is vastly different.

PLAY BASED LEARNING AS A SOLUTION

Monotonous repetition has the potential to lose the interest of the learner, however, by undertaking play theory as a methodology, the research has explored a number of effective methods that address the mundane action of repetition through the use of technology. By using multiple sensory activities and personalised, project-based learning, one can be motivated to complete the otherwise tedious and monotonous practice of repetition.

There are three areas combining technology and writing by hand the research has focused on. These methods have identified potential solutions concerning the decline in writing by hand in a technological age. All three solutions use technology, while also embracing the act of writing by hand. These technologies enable enriched experiences as

the connection from mind to hand is explored and not interrupted in the process by a keyboard or mouse. Innovatively engaging with technology and the range of new tools it allows can provide access to efficient methods that create availability for all and the ability to demonstrate self-expression with communication that connects a community.

TABLET FOR EARLY EDUCATION

There is an abundance of early education apps that engage the user on learning cursive handwriting on tablet platform. These apps use play along with multi-sensory feedback and gamification as a reward system, to entice the learner to continue with the monotonous practice of repetition to learn the letterform.

There are now a multitude of apps that can assist with learning literacy skills using touchscreen tablets (Neumann and Neumann 2017). Apps such as ABC Pocket Phonics analyse and aid handwriting skills, including alphabet tracing and activities that assist in the development of handwriting education (Walling 2014).

Apps to aid handwriting have been readily available on touchscreen tablets since their inception, and there is an abundance of these targeted apps to choose from. These apps assist with developing literacy skills to varying degrees, particularly those aiming to address the loss of cognitive function of the writing action previously restricted to pen and paper. As technology evolves the apps have become more sophisticated and able to more effectively mimic the pen and paper experience and handwriting skill development.

Exploring other technology-based alternatives to writing is extending technology past the keyboard. Equipment such as the touchscreen tablet and the invention of the Apple Pencil for Ipad or the Microsoft Surface Pro are all creating new ways to communicate visually that move away from the typical typing on the keyboard (Kim et al. 2016).

Technology in the classroom allows for individual creative learning but ultimately relies on the institutional system where a teacher-directed learning environment is in place (Kontkanen et al. 2017). A qualitative study exploring the role of technology in a high school classroom learning environment (Varier et al. 2017), shows the use of a technology-driven device, in particular, the iPad, encourages creative expression while enhancing communication. Using technology in a way that enhances learning such as using tablets for students to express themselves through drawing their ideas to communicate (Kim et al. 2016). This approach is fostering the use of picking up a pencil, perhaps an apple pencil, and writing by hand.

Together the tablet and handwriting apps are a suitable option for early education, however, not an appropriate option for a wider range of ages, or demographic such as a creative practitioner. A demographic that is seeking a more creative outlet, perhaps, may look for an option that can provide a realistic experience such as writing with a brush and using paint like effects with colour.

TABLET FOR CREATIVITY

Pressure sensitive tablets allow connection from mind to hand using a stylus instead of a mouse and keyboard. The tablet platform can create a sensory outlet for the user that allows for self-expression and creativity that more closely mimics the traditional pen and paper technique. Creative apps are resourceful opportunities to practice letterforms. With a range of realistic brushes available to download or creating the brush from scratch, the iPad provides another platform when practising and developing handwriting skills.

Tablets are also portable and allow for immediate access to practice, which can be used on the go and can fit into a busy schedule. Sometimes it is hard to accommodate regular practice, and finding these opportunities to practice are vital to handwriting improvement, even if it is twenty minutes a day (Hoy, Egan, and Feder 2011).

The development of creative apps for tablet devices and the use of a pencil introduce a multitude of choices for creative opportunities. An app that is representative of this is exclusive to the Apple iPad; Procreate. This app allows for content creation that could be compared to painting in Photoshop. Applications such as this have turned the tablet from a novel device to an essential tool in the designer and artist's toolkit. As technology advances, the ability for artists to engage with these tools to mimic traditional techniques make available what we have access to, today. With technology developing at such a rapid pace, continually creative tools are being made available. It is an exciting time to be a creative with the technology we have at our fingertips; the opportunities are endless.

VIRTUAL REALITY

There are many different styles of handwriting and with each style requiring different actions. For example, when learning pointed pen calligraphy, finger movements are used to create the body of the letterforms. When executing the loops on the ascenders and descenders, more of the wrist is in use. When creating large flourishes, the whole arm is in use, as there is more area to cover (Spencer Authors 1874).

This action is a similar movement to life drawing, as one stands at an easel drawing from the hip, using the whole arm. The scale of the technique is at play here. No matter what scale of the activity (from hand to full body movements), if the focus is on learning the movement and the strokes of the letterforms, we can start to play and experiment with a range of different platforms.

An exciting area to look at is technologies using creative apps in virtual reality (Thornhill-Miller and Dupont 2016). By experimenting with apps such as Tilt brush in virtual reality, one can practice the letterforms in an environment that uses an immense scale and depth. This action is similar to drawing at an easel by stepping into each stroke and using the whole body to create the strokes.

However, when writing in VR the user is not limited to the dimensions of the easel. This environment allows movement through space, using running writing, in a literal sense, on a significant scale. As previously discussed, memory is another essential factor to learning letterforms. Research shows by using motor memory rather than tracing

the letters, uses more brain activity, in turn locking in memory (Steele et al. 2015). Virtual Reality apps such as Tilt brush provide a number of options, such as constructing the letterform by memory (without the use of guides), to importing personal resources and guides into the environment to trace.

Guides are helpful when writing out sentences to achieve consistency of height and angle of the letterforms. There is an opportunity to pull out grids with infinite scale options where the stroke locks onto the surface of the grid. Options to use grids or to write freely in the virtual reality environment are effective ways to learn the letterforms.



Figure 2. Elizabeth Reed, Practice in virtual reality, Tilt brush, 2017.

The pen to paper sensory experience is definitely lost when writing in virtual reality but is replaced with another experience. Freedom comes to mind, as there are fewer restrictions on writing in VR space. The resistance of the nib scratching against the paper fibres is a very tactile experience, whereas writing in VR is liberating and freeing without the limitations of scale and boundaries. These are very different experiences; however, both are using the bodies actions to build muscle memory and transfer information back to the mind to retain information of the letterforms. Writing in this immersive environment is creating an exciting platform to practice the mundane action of repetition. Moreover, it provides another area that can be utilised when using sensory rich activities to improve handwriting while enhancing the learning experience.

AUGMENTED REALITY

Another area the research has investigated is Augmented Reality. This latest technology allows the user to manipulate their live environment around them, easily accessible through technologies such as a smartphone app. It allows for immersive interaction and communication, where users can, for example, insert handwritten messages for others to find in their environment.

Apps such as Layar allows the user to create interactive augmented reality experiences with predesigned content and place them within an existing environment, the experience is augmenting or adding another layer to what is already there and is available to be discovered by others. Similarly, the World Brush app allows users to create their own content and leave messages in the environment for others to discover.

These apps are inviting users to interact with each other, connect with and ultimately communicate in an entirely new way. Writing or drawing by hand is an important factor of this new form of communication. Rather than relying on previous technologies such as the keyboard and mouse, both virtual reality and augmented reality has the potential to utilise practised motor skills combined with latest technologies, providing a reason for writing by hand to be valued, and the letterform to be practised.

CONCLUSION

Technology has caused a decline in handwriting in recent years, however, as the research seeks to demonstrate, technology can also be the solution. By using digital technologies to simulate a writing response rather than a typing response we see a regained interest in writing by hand, reimaged in digital mediums.

With the rapid changes driven by technology, particularly the immediacy of digital communication; providing information quickly and efficiently is a typical priority but delivering this content creatively to express ourselves is vital also. The growing availability of technology at our fingertips, with the virtual and augmented experiences that benefits from handwritten methods are reinventing ways to communicate by writing rather than typing. For this reason alone we should not step away from the traditional skills of writing by hand; in fact, as we move toward a more visual way of communication, now more than ever we should be putting pen to paper (in any of the mediums discussed) and valuing practice with our fine motor skills.

Improved fine motor skills, the ability to retain memory and the capacity to have access to our subconscious that stimulates our creativity, will be an invaluable combination for future technologies. The way we communicate has irrevocably changed; we have a range of additional digital tools to add to our creative toolkit. Due to the immersive nature of growing technologies such as Virtual Reality and Augmented Reality, writing or drawing by hand is an important factor of this new form of communication. The loss of skills and abilities the decline in handwriting has been attributed to (James 2017), could be recovered through the use of traditional skills combined with new technologies. Writing or drawing by hand is an important factor of this new form of communication.

Images

Figure 1. Theory of Spencerian Penmanship, Spencer Authors, 1874.

Figure 2. Elizabeth Reed, Practice in virtual reality, Tilt brush, 2017.

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