**Hand in Hand: The confluence of Braille and Technology in Specialist Education and beyond**

By S Randall and SJ Potter, New College Worcester
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# Introduction

We are Sean Randall (IT specialist) and Susan Potter (Head of Braille) at NCW; a secondary school for vision-impaired students.[[1]](#endnote-1) For decades, braille has been a fundamental tool enabling vision-impaired people to read and write. Yet fluency in the reading of braille, plus its ready availability, has been in decline of late. Through personal experience, case studies and conclusions we aim to explore how this is changing in today's world and how technology and braille are dynamically and successfully working together to promote wider reading, writing and much more.

## Background, SP

I'm deeply grateful to have been read to as a child, thus instilling in me a love of literature and language and a thirst to read for myself because, no matter how good the reader, the character images created in my head seldom matched the voices they gave them! I was educated entirely in special schools, learned braille at an early age and always loved it. However, I was keenly aware that my bulky books posed barriers at home and elsewhere and made me "different" from those around me. Although I still use hard copy braille, I now enjoy using a braille display for both work and leisure. It is delightful to be able to carry lots of books with me and to read for pleasure, study and make notes at will and with no fuss, as well as being able to read what I have written on my computer rather than relying on synthetic speech. For me, the interaction between braille and technology in recent years has opened up a whole new world with wonderful possibilities of which I could never have dreamed relatively few years ago.

## Background, SR

Having attended mainstream school as a child in the 90’s, braille was one more brick in the wall that built me different from my peers. Tuts and scathing looks during maths lessons at the noise of my Perkins[[2]](#endnote-2), not to mention the unfairness of double-length spelling tests because of learning to use both English and contracted braille are haunting memories. Yet the thing that really got under my skin was the library: shelf upon shelf of choice for everybody else, and a miserable box of dreary-looking volumes which only really meant a small handful of books for me, often long after my friends had moved on.

Decades on, combine braille with technology and I would not be without it. Whether I am reading my daughter a bed time story, playing a board game, taking notes or checking a student’s work, braille is always there to make the process more discrete, accurate, or enjoyable. It fits around my life now, rather than driving a wedge between myself and the world I want to inhabit.

# Technology shifting Braille forward

## Braille, SP

When I was being educated, life was simple. Everyone learned and used braille, writing on a Perkins hand reading bulky books. As well as our own braillers, most of us had a writing frame and stylus[[3]](#endnote-3) – mostly pocket-sized and we had to do a full page of “dotting” practise each week, writing backwards and not being able to check our writing until the page was finished. We used cubarithms[[4]](#endnote-4) and abacuses alongside our braille machines for Maths and learned to touch type on manual typewriters without the benefit of speech to alert us to errors.

Not so now. Students I teach use a wide variety of equipment to support them in reading large print and braille, not to mention speech. Sometimes this can be bewildering. Do we really need so many different note takers and screen readers? Are students able to develop a real working platform for themselves? What impact does this have on braille learning and usage?

Although large and hugely conspicuous, the books we had were wonderful, with exploration made easy due to a rigorous uniformity of style. A two-cell indent **always** meant a new paragraph; a blank line **always** meant a major side-heading; a solid line of twelve centred colons **always** indicated a new chapter. Although this is still true of materials produced by transcribers following UKAAF[[5]](#endnote-5), the waters become muddied with the prevalence of refreshable braille[[6]](#endnote-6) where spacing is compressed and self-directed transcription.

Most of the students I teach start learning braille as teenagers, having struggled with large print or speech, or having suffered sudden sight loss which means they can no longer read the print size they used to. Student S who began learning braille at age 13 says: “I like books because you can tell how far through the volume you are and it’s easy to know what’s coming next. However, I find moving from line to line difficult and sometimes the dots are very faint. I like the Orbit[[7]](#endnote-7) because the dots are always the same and I only have one line to deal with at a time – but sometimes the braille is not what I’m used to, which I find confusing.” A witnessed example from this student was a miss-translated italic sign. Student S’s processing difficulties meant that this was a real challenge which she was unable to ignore.

Student J who began learning braille at 17, says that had he not been presented with the option of magnification, he would have learned braille much sooner. He had to learn the Literary and Maths codes very quickly because he can no longer use large print to any great extent and is taking exams for a University place to study Mathematics.

There is no doubt that revolution has been caused by the rise of opensource software such as NVDA[[8]](#endnote-8) and Liblouis[[9]](#endnote-9), coupled particularly with the Orbit 20 reader with its immediacy, logic and low price. These are formidable elements in access for the vision-impaired, giving many more people ever wider access to the world around them.

## Technology, SR

It has long been a dream of mine to be able to acquire and enjoy a fiction novel with the same speed as my sighted counterparts, as already mentioned. I have seen this in action many times now; I have been able not only to acquire, but make a good start on reading, a Kindle book before my family member has driven to the book shop and brought a print copy home. Indeed, I have “midnighted” [[10]](#endnote-10) books on day of release with strangers online, and the issue of how much they or I could see has become totally irrelevant, something that still astounds me to this day.

There can be no doubt that technological development in both braille software, and now hardware, is responsible for this and so much more. Whilst changes in the underlying piezoelectric cells[[11]](#endnote-11) may have been slow, new technologies such as the Orbit and Canute[[12]](#endnote-12) push hardware into ever widening circles. Writing is also impacted; student F regularly refused to use a laptop until she learned she could use a six-key entry method similar to her Perkins, rather than learning to touch-type and now she is unstoppable.

As braille becomes imbedded in more devices and processes at a lower level, so it will continue to grow and become more widely available. An excellent example of this came from a meal I shared recently with a deafblind friend. She writes: “For the first time ever, I was able to be the controlling voice during a meal in public. For under £100.00 I was able to take inconspicuous technology in my handbag to a restaurant and communicate my needs to sighted staff without prearrangement or additional assistance from my dinner companion, who had always hither to interpreted- by reading Braille I wrote aloud and Brailling verbal responses from others back to me. Paying the bill and being able to order him another drink without him even knowing are memories I will cherish for years to come, because they are my first steps to a previously unobtainable level of public independence.”[[13]](#endnote-13)

# Self-directed transcription

## Braille

As already mentioned, I teach students who have come to braille relatively late in education – mostly in their teenage years. This presents difficulties in that time is limited because students are studying for major qualifications and because they have not benefitted from any pre-braille programme which builds up fine motor skills, as I did. Many students find tracking back along a line and moving down to the next extremely difficult, and this is where refreshable braille for reading really comes into its own. Students can align their finger(s) precisely and maintain that position so as to read all the dots in each cell whilst their equipment moves from line to line at the touch of a button. Reading is made easier due to the dots always being of a uniform size and shape. Two students, both of whom have started reading with the Orbit recently, already read more smoothly and confidently and at a slightly increased speed. I’m sure they will fly once the habit of pressing the panning buttons becomes automatic. Students R and S agree that their confidence has grown because they no longer have to think about rubbed-down dots and finding the next line.

If transcription is to be more self-directed, and if books are downloaded from sources other than institutions producing “top notch” braille, should we now be so particular about teaching – and wanting students to use – “correctly” formatted braille? For instance, a paragraph marker on a BrailleNote is denoted by a blank line rather than by a two-cell indent, and bullet point markers are hardly ever where they should be according to UKAAF’s guidance. Does this matter?

To my mind there is nothing like the feel and weight of a well-produced book and knowing exactly where you are – almost at the end of the volume, or of a chapter. Some students share this passion, although skimming and scanning techniques are not so strong, due to the fact that uniformity of style is not always observed, especially in recent years, in some exam papers. The disadvantage of a refreshable braille display is that you don’t really know where you are or how far you have to read, although it must be acknowledged that easy searching and being able to begin reading from exactly where you left off is definitely narrowing the gap.

## Technology

I will never forget my initial reaction on hearing that there was an authority involved with establishing braille standards, and when the UK was officially “moving” to UEB, which was incredulity. It felt as if someone had told me the English language was being reshuffled a little, and it took some time for me to adjust to braille-as-code rather than braille-as-medium. I had always personally played fast and loose with the rules. Braille Dymo labels[[14]](#endnote-14) adhered to all sorts of unlikely places, scrabble tiles formed cryptic notes, and cubarithms were set out if I had a particularly complicated hexadecimal number to convert to base10 or a computer’s subnet to calculate for a homework assignment.

Seeing students effortlessly acquire and convert reading material to braille on their own reminds me of this. “Quick-and-dirty” is the term that has been coined for this rough-and-ready braille, produced by machine translation rather than skilled transcribers. It is interesting that a majority of students prefer this to having to wait for an official version of a text. The infinite flexibility of the converter makes different things possible: student T often asks for short stories minus any capital signs[[15]](#endnote-15), or with all spaces truncated for example, something impossible when you’ve already got the thing on paper. Are we starting down a slippery slope here, though? The values engrained in good braille teaching, and indeed in the format specifications for braille itself, increasingly only seem relevant on paper and of less real-world value to today’s youth.

Also, we find parents are traditionally one of the strongest barriers to braille, in large part due to a shared familial comprehension for audio books and listening and a corresponding terror of a format they cannot easily comprehend. Will the ability to produce (and back-translate) braille without specialist help impact this? That is one of the questions we have not yet had the technology long enough to answer.

# Multiformat approaches

## Braille

Although the DAISY project[[16]](#endnote-16) was not altogether successful, vision-impaired people have a huge capacity for using multi formats depending on where they are or what they are doing. For instance, my contribution to this paper was written on a laptop with speech (at home) and an Orbit (when not at home). I tend to listen to short documents or emails, but prefer hard copy for documents such as my timetable or instruction manuals. I sometimes use a Perkins (or even a frame) and enjoy a book via either hard copy, refreshable braille or audio.

Student J (referred to earlier) uses a combination of synthesised speech, braille and (for short periods) large print. Student R, who has difficulty with language, will read the same book in audio and her Orbit so that she can gain the sense of the book through listening and then struggle with our terrible English spelling system through braille! Recently we had a potential student visit us for a pre-placement assessment who had learned braille from infancy alongside touch-typing. He proficiently uses a Perkins for calculations, BrailleSense[[17]](#endnote-17) and laptop with speech depending on what he is doing, and which piece of equipment is best for the job. He fulfils my dream for every student of having a complete “tool kit” and instinctively knowing which “tool” is best.

# Distance, self-directed and incidental Braille learning

## Braille

As well as teaching students, I also teach braille to sighted staff. Although we use conventional materials and methods, some of our staff supplement their learning with other sources such as the UEB-Online course[[18]](#endnote-18), an excellent self-teach tool, especially because you can’t move to the next line until your current line is absolutely correct, thus making you take in and learn the more complex contractions and rules.

One staff member, wanting to get ahead, began her braille learning with UEB Online because she was going on holiday abroad and couldn’t fit a brailler and paper into her suitcase! She said: “I found the UEB course an effective way to learn… There were a couple of occasions where I got completely stuck on writing a word and the system doesn’t let you progress until you have it all completed correctly. I literally had to leave the session and come back at another time and look afresh at the task as I was stumped. It would have been useful at that point if there had been some way to get help although eventually on both occasions, I worked it out, so I guess they are also teaching resilience!” Another said: “I used UEB Online as a secondary source for learning braille. I already had a basic grasp of braille and had worked my way through most of the Primer[[19]](#endnote-19) before using UEB Online. I found it very useful for practice and re-doing exercises to reinforce my knowledge.”

Braille alphabet cards and the like – very popular at exhibitions, etc. - give an interested person a good basis for understanding braille, especially when they can show off to their friends by reading some signage, which is becoming increasingly popular.

# What we leave behind

## Technology

Whilst working with our students and their new technologies, a number of questions have arisen about traditional braille. We have already discussed some of the implications both in terms of braille formatting and layout, and in terms of the quality of produced braille and its impact on the young.

Inevitably, issues surrounding this will bring up more questions still. How many things are accessible in braille, but no longer embossed, for instance? Conversely how many things are put down on braille paper, then read once and thrown away? What is the environmental impact of producing hundreds of TV listings or terms and conditions in braille, documents designed to be read, acknowledged and then forgotten about?

In terms of screen access technology, there is a growing trend for vision-impaired young people to turn up with their own access needs met by technology they carry, rather than relying on provision from an employer or governmental assistance. Is this likely to carry on into braille production, and what impact will this have on the availability of transcribers, and those versed in producing expert braille codes such as Maths, music, and so on?

One of the most interesting contrasts that came up during our collaboration on this paper is also worth noting here. SP told me that a highlight of her week at school was receiving a Braille letter from her mum: even if it was only a short note and without much special news from home, the fact that they were able to communicate without a person in the middle to translate or interpret was very important to her. For me, the exact opposite has become a staple. I feel very much accepted when sighted colleagues leave me handwritten post-it notes, knowing that I am proficient enough with my technology to be able to decipher them. It is a huge step that the equipment I use has come so far that I can work in their native medium on some level, even if to a limited degree, perhaps in the same way that SP’s mum felt accomplished and proud by being able to access Braille as a sighted parent of a blind child. We found this contrast most intriguing, and a poignant example of how a generation has gone bye and what changes that may have wrought.

It seems clear to us that technology is only going to continue to cause braille to change. Its place in society is either assured or doomed, depending upon who you ask. Whilst statistics are thin on the ground, it is evident that the number of people reading braille regularly has fallen over the last two decades. Yet what we cannot say empirically is whether those people now read more widely, even though that is the feeling we have from our work at NCW, and perhaps more significantly, whether the range of technologies they have access to will, in the long term, cause braille to rise again.

# Footnotes

1. New College Worcester (NCW) is a residential school and college for people who are blind or vision impaired. It has its roots in the founding of the Worcester College for the Blind in Worcester in the year 1866. One of the key aspects of studying at NCW is the additional curriculum of support for students, which includes regular personalized Braille and Technology Support lessons as part of the daily lesson timetable. [↑](#endnote-ref-1)
2. A mechanical Braille typewriter used to produce Braille on paper since 1951. [↑](#endnote-ref-2)
3. Equipment for writing Braille by hand where the user pushes Braille dots through the back of the paper using a stylus. [↑](#endnote-ref-3)
4. A series of cubes which slot into a board such that one face of the cube is visible at any given time. Each face of the cube holds a representation of a Braille number, allowing the blind to lay out and solve mathematical problems. 15 lines can be presented on the board at any given time and cubes easily removed and rearranged to adjust the numbers. [↑](#endnote-ref-4)
5. The UK Association for Accessible Formats, setting UK standards for quality accessible information for users with visual or print impairments. [↑](#endnote-ref-5)
6. Braille displayed with mechanical pins on an electronic device rather than on paper. It is called refreshable because the cells move as the reader works their way through the displayed material. Refreshable Braille displays typically show between 14 and 80 Braille characters at a time on a single line and can range in price from a subsidized purchase for young people costing £40.00 to £7,500 for the most expensive products. [↑](#endnote-ref-6)
7. Fully “the Orbit Reader 20” - A 20-cell Braille display costing significantly less than its competitors because of a new hardware model used to display the cells. Orbit’s are growing in popularity across the world due to their price, and have the facility to act as book readers, note-takers and display the screen, in Braille, from computers, phones and tablets. The comparatively slow cell refresh rate and distinct clicking sound made during their operation are some tradeoff factors for the low cost of the Orbit. [↑](#endnote-ref-7)
8. Fully Non-Visual Desktop access: a free screen reader for Windows computers, initially developed by 2 blind computer programmers in April 2006. As of January 2020, it has an estimated average daily user-base of roughly 38,000 users worldwide. NVDA can speak text from the computer, as well as send it to a supported Refreshable Braille Display. [↑](#endnote-ref-8)
9. An open-source computer program and software library for translating from print to Braille and back again, maintained by a community of volunteers and Braille enthusiasts for the last 18 years. [↑](#endnote-ref-9)
10. A meeting of bibliophiles, usually in the early hours of a morning, congregating over the release of a new book. Whilst previously limited to meetings in book shops, the practice has grown to use Online chat rooms. [↑](#endnote-ref-10)
11. An historic and traditional way of producing Refreshable Braille, a complicated and expensive mechanical component that is part of the reason for high cost of most electronic Braille devices. These cells provide the fastest and quietest devices on the market, but at a higher price. Contrast with the Orbit and Canute. [↑](#endnote-ref-11)
12. A low-cost multi-line Braille book reader using an alternative display method for its cells. The noise whilst in operation and slow refresh rate of the cells, similar to the Orbit, are different to traditional Braille displays. [↑](#endnote-ref-12)
13. The technology in question was an Orbit Reader 20, and the ORChat software running on an Amazon Fire tablet. The cost to the customer of these items together, with a grant from the RNIB and VICTA was only £90.00 [↑](#endnote-ref-13)
14. Narrow, sticky-backed Braille labels produced in a mechanical label writing device. [↑](#endnote-ref-14)
15. In Braille, a lower and uppercase letter use the same symbol. Capitals are indicated with a prefix, taking up at least 1 of the cells on a Refreshable Braille display. Confident readers who already know the rules of capitalization may choose to turn these off to maximise how much meaningful information they can fit on their displays. [↑](#endnote-ref-15)
16. A standard for producing “accessible” books, potentially combining Human-read audio and the written text of a work with advanced navigation and bookmarking facilities. In the UK, DAISY books have not flourished in education and their most widespread use in the US is for leisure reading with synthetic speech or Refreshable Braille. [↑](#endnote-ref-16)
17. A specific type of Braille Notetaker, containing Braille display, keyboard and a sweet of software for working on documents, reading emails etc. [↑](#endnote-ref-17)
18. A website with several interactive Braille-learning courses to be completed on a computer. Unique in its provision of a version holy usable by the blind. [↑](#endnote-ref-18)
19. A comprehensive reference book to contracted Braille for those wishing to learn to write or read it, currently sold through the RNIB. [↑](#endnote-ref-19)