

## What's the use of handwriting?

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### Executive Summary

Handwriting is sometimes portrayed as a practical skill that is becoming less relevant in the modern world. Both in the UK and USA, the teaching of handwriting has a low status in literacy teaching with either minimal assessment or time focused on the activity.

A recent survey by Berol and Paper Mate as part of the *Write Your Future Campaign* has shown that “a third of teachers (31%) spend less than 30 minutes teaching handwriting each week. This is in stark comparison to nearly half (47%) that spend over four hours teaching maths – with just 4% of teachers spending the same amount of time on handwriting.”

Where handwriting is mentioned in national curricula, the major aim appears to be that children learn to produce neat, legible writing. Whilst this is of course an important facet of writing, it does not focus on perhaps the most important aspect of learning handwriting – developing the ability to write fluently and automatically.

Research shows that making handwriting automatic frees up the brain to work on the composition of what is actually being written. Additionally, there is evidence to show that the physical movements involved in writing by hand are part of the thinking process in writing.

Indeed, handwriting is not simply a motor skill but a significant element of literacy in its own right and the ability to write fluently and automatically has been shown to be an effective predictor of achievement in mathematics as well as in English.

It is therefore clear that handwriting continues to have a critical role to play as a medium for effective learning, alongside the use of digital technology.

Yet, many of the research insights now available to us concerning handwriting are not widely known to teachers.

The research also shows that for many children, handwriting continues to be challenging well into the secondary years, and beyond. This highlights the importance of not only getting the teaching of handwriting right at an early stage but of continuing to develop handwriting throughout secondary education.

It is very clear therefore that a good deal of development is required in this area, as are new resources and tools which equip teachers and parents to help children develop this essential skill more effectively. That is why we are supporting the *Write Your Future Campaign* which aims to support this, through the development of new resources and raising awareness about the important role handwriting has to play in learning and development.

We will also shortly be releasing further primary research as part of the campaign, looking into the practical ways in which mark-making and letter formation can be developed in both early years' settings and at home. [www.writeyourfuture.com](http://www.writeyourfuture.com).

## Introduction

It has become commonplace to say that handwriting is in general decline. According to a survey of 2,000 people conducted by the UK printing and mailing company, Docmail<sup>1</sup>, one in three people had not written anything by hand in the previous six months. On average they had not put pen to paper in the previous 41 days. The issue is not, however, restricted to adults but is apparent in our education system.

For example, in the United States, education authorities appear to have accepted this decline. “Cursive” writing – in which the pen is not raised between each character – was dropped from the Common Core Curriculum Standards, following the evidence that email and texting have more or less replaced “snail” mail, and that students tend to take notes on their laptops, rather than via handwriting. Since 2013 American children have been required to learn how to use a keyboard and write by printing. But no longer do they need to worry about the strokes and shapes involved in “joined-up” writing. The *Los Angeles Times* (4 September 2013)<sup>2</sup> hailed this as a step forward.

*“States and schools shouldn’t cling to cursive based on the romantic idea that it’s a tradition, an art form or a basic skill whose disappearance would be a cultural tragedy. Of course, everyone needs to be able to write without computers, but longhand printing generally works fine [...] Print is clearer and easier to read than script. For many, it’s easier to write and just about as fast.”*

Such negative views about the importance of handwriting in the modern world (or, at least, in the US, of cursive handwriting) were summed up by Trubek (2016):

*“I am a college professor and a freelance writer, and the only time I pick up a pen is to sign a credit-card receipt. Let’s stop brutalizing our kids with years of drills on the proper formation of a cursive capital ‘S’-handwriting is a historical blip in the long history of writing technologies, and it’s time to consign to the trash heap this artificial way of making letters, along with clay tablets, smoke signals, and other arcane technologies”.*

Why has the role of handwriting, and by extension, its teaching, become so diminished?

## The decline of handwriting

In the United States, handwriting was once taught in schools as an individual ‘subject’ and children received a separate grade for it (Blazer, 2010). However, more recently, the importance of handwriting in education has diminished significantly (Dinehart, 2015). In the US, schools now appear to be less likely to teach handwriting and few teachers feel well prepared to teach it (Graham et al., 2008).

This position is also reflected in the United Kingdom, where handwriting has quite a low status in literacy education (Medwell & Wray, 2008). The National Curriculum in England (DfE, 2013) does set mandatory requirements related to handwriting, requiring Year 3 and 4 children (7 to 9 year olds) to:

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<sup>1</sup> e.g. <http://www.dailymail.co.uk/sciencetech/article-2163175/Could-forget-WRITE-The-typical-adult-scribbled-hand-weeks.html>

<sup>2</sup> <http://articles.latimes.com/2013/sep/04/opinion/la-ed-cursive-instruction-common-core-curriculum-20130904>

- *use the diagonal and horizontal strokes that are needed to join letters and understand which letters, when adjacent to one another, are best left unjoined*
- *increase the legibility, consistency and quality of their handwriting [for example, by ensuring that the downstrokes of letters are parallel and equidistant; that lines of writing are spaced sufficiently so that the ascenders and descenders of letters do not touch]*

However, whilst there are a number of formal tests to assess pupils' progress through the National Curriculum, none of them include an assessment of handwriting. Handwriting is only addressed through on-going teacher assessment but not in any way that encourages teachers to ensure meaningful progression (Standards and Testing Agency, 2016). The lack of any formalised testing indicates the low status that handwriting has, particularly when compared with other literacy skills.

This summary of the place of handwriting in UK mainstream primary schools reflects the minimal attention given to handwriting in the writing process in most English-speaking countries<sup>3</sup>. One reason for such a lack of attention has been the perspectives on writing that have been popular in schools and the limited amount of emphasis these place on handwriting.

Focus has been placed, in early years' education, on encouraging children to write meaningful texts from the very beginning (Teale & Sulzby, 1986; Hall, 1987). For older children, the process writing approach (Graves, 1983) encouraged a focus on composition, and the genre approach (Wray and Lewis, 1997) emphasised the teaching of socially significant text structures. None of these approaches placed any emphasis at all upon handwriting, with the consequence that the teaching of handwriting tended to be neglected.

The place of handwriting has also been highly affected by the ubiquity of computers and various other screen-based writing media. A good deal of media attention in the UK was given to the decision of Finland to abandon the requirement for children to master traditional cursive handwriting. Instead, the emphasis would be on the teaching of touch typing and the most efficient way to compose a text message<sup>4</sup>. To many, the ubiquity of computer and smartphone text entry seemed an inevitable pressure pushing us away from writing by hand.

In the Washington Post in 2013<sup>5</sup>, even Steve Graham, whose research we will review later as we examine the argument that handwriting is linked to composition, was quoted as suggesting that handwriting, particularly cursive writing, was under some threat:

*“The truth is that cursive writing is pretty much gone, except in the adult world for people in their 60s and 70s.”*  
*He said that today’s teachers value typing more than handwriting, and that by the 12th grade, about half of all papers are composed with computer word processing.”*

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<sup>3</sup> This is not the case in non-English speaking countries. In countries such as France, a great deal of attention is given in teaching to fluent cursive writing. A useful summary of the relations between handwriting and culture can be found on the European Mama site - <http://www.europeanmama.com/handwriting-around-the-world/>

<sup>4</sup> <http://www.telegraph.co.uk/news/worldnews/europe/finland/11391999/Finland-to-teach-typing-rather-than-handwriting-in-schools.html>

<sup>5</sup> [https://www.washingtonpost.com/local/education/cursive-handwriting-disappearing-from-public-schools/2013/04/04/215862e0-7d23-11e2-a044-676856536b40\\_story.html](https://www.washingtonpost.com/local/education/cursive-handwriting-disappearing-from-public-schools/2013/04/04/215862e0-7d23-11e2-a044-676856536b40_story.html)

In the face of such decline, what are the arguments for continuing to teach handwriting in schools?

### **Why does handwriting matter?**

#### **a) Handwriting and memory/cognition**

Does writing by hand help us to remember and think about ideas? Recent insights into this question have come from research at both ends of the educational spectrum: with very young children, and with college / university students. These suggest that there is something particular about handwriting which works to develop thinking / cognition, and helps to fix ideas in the learner's mind (memory).

In a study with four- and five-year-old children, James and Engelhardt (2012) used magnetic resonance imaging technology to observe the effects on brain activation of children engaging in a variety of writing-like activities, such as writing letters by hand, tracing letters and typing letters. They found that areas of children's brains previously associated with reading (the so-called 'reading circuit' (Wolf, 2007)) were activated when the children wrote letters to a much greater degree to when they engaged in other forms of sensorimotor activity, including typing of letters. The extent to which such activation influences children's development is not clear – we are still in the early stages of an understanding of neurological influences on literacy skills. Nevertheless, a reasonable conclusion might be that writing letters by hand has an effect in the development of reading in young children.

It has also been shown that writing skills developed before children enter formal schooling can predict their academic achievement years later. Dinehart and Manfra (2013) examined the links between the fine motor skills of preschool children and their academic achievement two years after starting school. This study was a large one, involving over 3,000 young children, all of whom were observed undertaking a range of fine motor tasks. Some tasks involved fine motor manipulation, such as building with blocks, weaving string, lacing beads and cutting with scissors, and some fine motor writing tasks, such as copying letters, numbers and shapes, and drawing simple objects such as people and houses. The children's effectiveness in carrying out such tasks was measured and these outcomes compared with their later achievements in school.

The results were illuminating and suggested that those children who were more adept at fine motor writing skills were seen to have higher achievement in reading and mathematics in later years.

Research such as this is as yet in its infancy but these results are promising in that they confirm a need for some direct teaching of the skills of letter formation in the early years. The research is reviewed by Dinehart (2015) who makes the point that:

*There is little evidence to support the notion that children will 'catch' writing skills, and the ability to produce high-quality text is only expected to develop once transcription skills are fully developed (8).*

Graham (1999) has also made the point that if teachers only give specific emphasis to handwriting when children have failed to 'catch' it, then a great many poor habits may well be developed which become progressively harder for teachers to remedy.

Students experiencing later stages of education, that is, college and university, have to make choices about the way in which they record the ideas and information which they need to

remember and understand. Most college students are regular users of digital technology<sup>6</sup>, integrating this into their studies in a number of ways, such as using their laptops to take notes in lectures. However, in a much quoted study, Mueller and Oppenheimer (2014) found that college students who took notes on lectures using handwriting remembered more about these lectures than their colleagues who used a laptop to take notes. Importantly, the notes taken by the laptop users tended to consist of verbatim quotations from the lectures, rather than reframings of the ideas they had encountered, suggesting a more surface processing of the lecture material than those who took handwritten notes.

The study of Mangen et al (2015) supports this, finding that college students who wrote down lists of words by hand recalled them more effectively than did students who used laptops or iPads to record the words. The researchers suggest that because the demands of each of these writing modes are quite different, they involve different cognitive processes. In handwriting, the writer has to use graphomotor processes to form each letter, that is, they produce a graphic shape which is as close as possible to the standard shape of the specific letter. These graphomotor processes may lead to a richer encoding of the words, facilitating their storage in long-term, as opposed to short-term, memory.

Mangen and Balsvik (2016) have added to this by studying what is known as embodied cognition. This focuses upon the role of body movements and motor activity in human cognitive processing. Embodied cognition implies that human thought (cognition) is not limited to internal processes within the brain, with body and motor activity then being controlled by such mental activity. Rather, this cognitive processing is actually dependent upon the body, its postures and movements as it engages with the physical environment in which it lives. Such a perspective thus provides an explanation as to why cognitive processes such as remembering, reflecting, and reframing might be affected differently by the different motor processes involved in handwriting or typing. Put simply, when you type a word you have heard, the processes involve simply selecting symbols from an array of possible symbols (hunting for the key to press). When you handwrite, however, the mind and body have to work together to create a set of symbols which best represent an existing mental image. The engagement of brain with physical activity is here a good deal more elaborate and extensive, which may account for its longer term effects on understanding and memory. In short, handwriting is a more thoughtful activity than typing, with thought being defined in the wider sense of brain-body interaction.

### ***b) Handwriting and composition***

There has been a substantial body of research on the writing process over the past 20 years which, somewhat surprisingly, has had little impact on classroom practice. This may be because much psychological research into children's composing processes has been experimental and non-naturalist in design, or focused on children with very specific special needs, which makes its direct application to the mainstream classroom problematic. However, it is in psychology, neuropsychology and special needs education that research into handwriting has taken place that may offer insights into the composing processes of mainstream children.

The complex nature of writing has been recognised not only in models of writing (Hayes, 1996) but also by policy makers (DfEE/QCA, 2000), teachers (Wray et al., 2002) and young writers themselves (Wray, 1993). Handwriting has been seen as part of the translation of ideas, or transcription. However, in teaching practice this has often meant that handwriting is seen not as a part of the composing process, but as a presentation skill. Despite this,

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<sup>6</sup> College and university students born after about the mid-1980s are referred to as digital natives by Prensky (2001), meaning that they were born into and grew up in a world where computers and other digital technology were ubiquitous.

research suggests that fast, automatic handwriting may have a significant effect on children's composing. This research suggests that for writers who do not produce letters swiftly and automatically, the actual production of written letters may interfere with their ability to compose text.

A key issue emerging from research (e.g. Berninger *et al*, 2006; Berninger & Graham, 1998) is the recognition that handwriting is far from a purely motor act. Berninger and Graham (1998) stress that it is "language by hand" and their research suggests that orthographic and memory processes (the ability to recall letter shapes) contribute more to handwriting than do motor skills (Berninger & Amtmann, 2004). Handwriting is not just about training the hand; it is about training the memory and hand to work together to generate the correct mental images and patterns of letters and translate these into motor patterns of letters - automatically and without effort! Thus handwriting is an important part of writing composition, and a language act, rather than just a motor act used to record writing.

Significant effort has been devoted to understanding the role of working memory in writing. This refers to the temporary storage of the information necessary for carrying out tasks. Unlike long-term memory, which can store virtually unlimited amounts of material for many years, working memory is limited in the amount of material it can hold (a few items) and in the length of time it can hold it (a few seconds). Exploring the role of working memory in writing may help us to understand the interference among memory processes that contend for the same scarce memory resources. The findings of Gathercole *et al* (2004) suggest that working memory is particularly associated with the literacy scores of younger children. In particular, if young writers have to devote large amounts of working memory to the control of lower-level processes, such as handwriting, they may have little left for higher-level processes.

Christensen (2005) points out that individuals can generally conduct only one cognitive task requiring attention at a time (Sweller, 1988; Sweller & Chandler, 1994). This means that in addition to the processes of writing such as idea generation, planning and revising, the way in which an individual manages his or her cognitive resources is also critical for successful writing (Saada-Robert, 1999). Christensen (2005) identifies two main strategies to limit the demands on working memory.

One is to sequence tasks so that only one task is undertaken at a time. This has certainly been a popular way to manage writing activities in teaching. Planning, drafting and revising have been identified as steps in the writing process in many classrooms, to help reduce their competing demands on young writers. Taking a superficially similar approach to investigating the relationship between handwriting and composing, some studies have investigated the effect of removing some of the competing demands for children's cognitive attention during writing and have produced interesting results. De La Paz and Graham (1995) found that when the children were able to dictate their texts to an adult, thus freeing them from the task of handwriting, the quality of composition improved.

A more practical and realistic alternative to manage the limited amount of working memory capacity is to make some processes, such as handwriting, automatic, in order to free up cognitive resources to deal with higher level processes. Automaticity is achieved when a process can be carried out swiftly, accurately and without the need for conscious attention (La Berge & Samuels, 1974). The development of skill in writing may require the automatization of lower-level skills so that they use less of the available working-memory resources – i.e. making handwriting automatic frees up the brain to work on the composition of what is actually being written.

The theory, practice and policy around teaching handwriting is underpinned by the assumption that handwriting becomes automatic relatively early on in writers' development

(Medwell and Wray, 2007). However, there is little evidence for this. Scardamalia, Bereiter and Goleman (1982) suggest that handwriting is not automatic until around age ten and that handwriting continues to demand cognitive attention throughout the primary years. However, Berninger and Graham (1998) offer very convincing evidence that, for many children, handwriting continues to be demanding well into the secondary years, and beyond. This highlights the importance of not only getting the teaching of handwriting right at an early stage but of continuing to develop handwriting throughout secondary education.

Research suggests that automatic letter writing is a very powerful predictor of length and quality of written composition in the primary years (Graham *et al*, 1997), in secondary school and even in the post-compulsory education years (Connelly *et al*, 2006; Jones, 2004; Peverley, 2006). However, we do not know when handwriting typically becomes automatic for children, in terms of age or of rate of letter production.

An exploration of this question underpinned the research reported by Medwell and Wray (2007, 2009, 2014). In these studies, firstly seven-year-olds, and then eleven-year-olds were tested using a relatively simple alphabet writing task, which involved writing in lower-case as many letters of the alphabet in order as possible in one minute. Children who completed all 26 letters in lower case continued the task using upper-case. The writing of all the children in the sample was also assessed as part of the statutory national assessments at age 7 and 11. Assessment of composition required the writing of two pieces - a longer and a shorter piece, of two contrasting text types. The pieces were marked by teachers using task specific criteria.

The studies found for each age group a high correlation between performance on the alphabet writing task and the composition assessment. It was important to establish if there was a threshold of automatic letter production for children of each age, below which a lack of automaticity had a particularly negative impact on the quality of writing. The studies did this by examining the relationship between the alphabet writing task scores and the age expected scores on the national assessments of writing. The results revealed that, for a seven-year-old child, achieving a score of less than 12 alphabet letters per minute on the alphabet writing task correlated highly with not achieving the expected national writing score (Medwell and Wray, 2007). For the eleven-year-olds the relevant score was 22 alphabet letters per minute (Medwell and Wray, 2009).

Medwell and Wray (2014) produced an interpolation of these threshold scores on the alphabet writing task which suggested a set of scores for children aged from 7 to 11 years old. If children were observed to score below these thresholds, we argued that their handwriting and writing capability would need to be investigated further. These threshold scores can be seen in the following table.

<b>Child age</b>	<b>Alphabet letters per minute threshold scores. (If children score below these, their writing/handwriting probably needs further investigation)</b>
7 years	12 alphabet letters written in one minute.
8 years	15 alphabet letters written in one minute.
9 years	17 alphabet letters written in one minute.
10 years	20 alphabet letters written in one minute.

11 years	22 alphabet letters written in one minute.
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The alphabet writing task used in the above studies has been employed in a range of research investigations (e.g. Jones and Christensen, 1999; Rosenblum, 2005) and forms part of the DASH (Detailed Assessment of Speed of Handwriting) test battery for handwriting performance (Barnett et al, 2007). Although children have plenty of opportunity to write all these letters in the course of their school work, they rarely write the whole alphabet from memory in sequence, so the task is not well rehearsed and demands organization and retrieval of letter forms in visual memory as well as the generation of the relevant motor patterns. This process has been termed orthographic-motor integration (Berninger, 1994), a key concept in current research into the importance of handwriting.

There is also a growing body of research to suggest that handwriting is critical to the generation of creative and well-structured written text and has an impact not only on fluency but also on the quality of writing (Berninger & Swanson, 1994; Graham *et al*, 1997). Lack of automaticity in orthographic-motor integration can seriously affect young children's ability to express ideas in text. (Berninger & Swanson, 1994; De La Paz & Graham, 1995; Graham, 1990). Further support for the proposition that automaticity in handwriting allow cognitive attention to be directed elsewhere comes from work in graphonomics (Tucha et al, 2008) which examines the pauses and acceleration profiles of children's writing using tablet technology.

Studies suggest that orthographic-motor integration accounts for more than 50% of the variance in written language performance in children. Christensen and Jones (2000) put this as high as 67% for the children (7-8 year olds) they studied. Puranik and Al Otaiba (2012) found that handwriting and spelling were significant contributors to written expression in kindergarten children. Yates *et al* (1994) also found that transcription skill was the best variable to differentiate good and poor writers among intellectually talented students in the primary grades. Some studies have indicated that the influence of orthographic-motor integration declines with age (Berninger & Swanson, 1994). Olive et al (2012) found that handwriting became more automatized in the higher grades and contributed less to cognitive effort for older children (Grade 9) than for younger children (Grade 5) in a French context. Other studies indicate that orthographic-motor integration continues to exert an influence on writing well into secondary school (e.g. Christensen & Jones, 2000) and beyond (Connelly *et al*, 2006; Jones, 2004; Peverley, 2006).

### **Conclusion: Some key lessons from research into handwriting, its place and function.**

The research suggests that the role of handwriting in writing has been underestimated in mainstream education. The concentration has been on the benefits to spelling and legibility of well formed, joined handwriting, and the necessity for speed and automaticity has been neglected in the teaching of handwriting. Educators have prioritised composing processes in writing, in itself not necessarily a bad thing. But in doing so we may have neglected a skill which makes a strong contribution to the composing we so value.

Handwriting, and in particular the automaticity of letter production, appears to facilitate higher order composing processes by freeing up working memory to deal with the complex tasks of planning, organizing, revising and regulating the production of text.

Research suggests that automatic letter writing is the single best predictor of length and quality of written composition in the primary years (Graham *et al*, 1997) in secondary school and even in the post-compulsory education years (Connelly *et al*, 2006; Jones, 2004; Peverley, 2006).



We know that a significant number of children experience handwriting difficulties throughout their schooling, although for most these are probably not judged as sufficiently serious to justify remedial action. More of these children are boys than girls and their handwriting difficulties are likely to impact upon their ability to compose written language. There is evidence that intervention to teach handwriting can improve not only the handwriting of these children, but also their written composition.

In a national survey, teachers in elementary schools reported using commercially available programmes to teach handwriting (Graham et al., 2008). Yet, teachers using these curricula were still failing to implement effective, evidence-based handwriting teaching strategies (Vander Hart et al., 2010). They tended not to devote an adequate amount of time to the teaching of handwriting, and their teaching tended to prioritise practice over explicit instruction. Teachers in these surveys mostly reported that they had not received sufficient training in the area in their initial and in-service teacher training (Graham et al., 2008; Brindle et al., 2016).

Some very similar findings emerged from the Berol and Paper Mate survey of UK teachers. The teachers clearly recognized that handwriting was important for their pupils, stating that 1hr 23 minutes was the amount of time they thought should be spent teaching handwriting each week. However, under 30 minutes was the actual amount of time that most teachers were able to spend on the subject. Additionally, teachers also reported a feeling of having been under-trained in the area of handwriting and a quarter reported that they simply don't have the time to teach handwriting effectively.

The research suggests, therefore, that it is time to reconsider the attention we give to handwriting in teaching:

- ***It is not simply a motor skill but a significant element of literacy in its own right. – and has been shown to be an effective predictor of achievement in mathematics as well as English.***
- ***Fluency and automaticity in handwriting are key contributors to quality in composition.***
- ***The physical movements involved in writing by hand are part of the thinking process in writing.***
- ***Handwriting is in many ways more effective as a medium for learning than digital text entry.***
- ***Many of the research insights now available to us concerning handwriting are not widely known to teachers.***
- ***This shows us very clearly that a good deal of professional development is required in this area, as are new resources and tools which equip teachers to help children develop this essential skill more effectively.***

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