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# Handwriting – A Forgotten Language Skill?

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Handwriting currently has a low status and profile in literacy education. This paper examines the situation of current handwriting pedagogy in England and considers why handwriting efficiency has been neglected. The paper goes on to identify a number of studies located in the domains of special needs and psychology which re-evaluate the role of handwriting efficiency. These studies suggest that handwriting is more than just motor skill and may make a very important contribution to children's composing of text. Existing research into the way handwriting efficiency affects composing suggests that further research, more appropriate assessment and focused intervention could all make a significant contribution to children's writing progress and might positively affect the progress of the many boys who struggle with writing throughout the primary school years.

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## Introduction

One way to gauge the current status of handwriting in mainstream schools in England is to examine its inclusion in the National Curriculum and the National Literacy Strategy. The National Curriculum for England (DfEE/QCA, 2000) treats handwriting succinctly and deals with the development of movement and style, without any attention to speed or efficiency. The attainment target for writing children at age 7 (level 2) demands that, 'In handwriting, letters are accurately formed and consistent in size' and avoids all mention of speed. For older children the attainment target for writing at level 4 (the target for 11-year-olds) demands only that 'Handwriting style is fluent, joined and legible'. Again, no mention is made of speed. Handwriting is statutorily assessed as part of the Standard Assessment Tasks and Tests (SATs), the marking schemes for which allocate up to 40 marks for writing at age 7 (Key Stage 1) and 50 marks at age 11 (Key Stage 2). At both ages, up to three marks can be awarded for handwriting. The assessment for these three marks is made on a sample of handwriting done during a composition assessment and the criteria include letter formation, orientation, relative size and fluency. As this is a product analysis, fluency must be taken to mean evidence of the effective joining of letters. Speed of writing is not included in the assessment. In short, this is an assessment of handwriting style, not of handwriting efficiency.

This summary of the assessment of handwriting in mainstream primary schools underlines the minimal attention given to handwriting efficiency in the writing process. This is also clear in the literature encompassing the National

Literacy Strategy (NLS). Handwriting is included in the word level objectives in the NLS Framework for Teaching (DfEE, 1998) until Year 4 (aged 9), after which handwriting does not appear as an objective. The assumption that handwriting will have been mastered by this time is common across publications about writing (e.g. Medwell *et al.*, 2001; Nicholls *et al.*, 1989; Wyse, 1998).

Further advice about the pedagogy of handwriting was given in *Developing Early Writing* (DfEE, 2001). This was based on the pedagogy of the 1980s (Alston & Taylor, 1987; Sassoon, 1990) and included the advocacy of a script with exit strokes, early joining (to an unspecified degree) and regular teaching and practice of handwriting outside the literacy hour. This advice was aimed at teachers of foundation stage and Key Stage 1 children (4- to 7-year-olds). Nothing was said about handwriting thereafter. The NLS training module *Writing* (DfEE, 1999) made no mention of handwriting at all and confined itself to discussing composition. Again, there was an assumption that handwriting should be automatic and unproblematic. In the light of research in the areas of neuroscience, cognitive psychology and special needs education, it is time to question this assumption and examine how research into handwriting efficiency can offer clues to improving composition. This paper sets out to review research about the role of handwriting efficiency in composing and to examine the important implications for educators and children.

## Handwriting Pedagogy

The pedagogy of handwriting in English mainstream schooling, and the requirements discussed above, are based on limited research into and writing about handwriting during the mid-1980s and early 1990s. The last significant educational research project into handwriting in England was conducted by Sassoon *et al.* (1986) and considered pencil grip and T-crossing. The most recent detailed publications about handwriting in education are some years old (Alston & Taylor, 1987; Sassoon, 1990) and even the available research reviews (Graham & Weintraub, 1996) were written over a decade ago and include little evidence from a British context.

This is not to say that handwriting pedagogy went away during the 1980s and early 1990s. In fact, building on the work of Peters in spelling acquisition, a very significant experiment took place in English schools. Alas, it was almost totally unresearched. This experiment involved a change in the handwriting script taught to children across Britain. Peters' research into spelling (1985) had suggested that English spelling was systematic in terms not of grapho-phonemic regularity, but rather of the probability of letters occurring together, offering a high degree of visual regularity. Peters emphasised the link between visual and kinaesthetic learning of spellings, stating that 'speed of writing is clearly basic to spelling progress'. A strong theoretical case was thus made for a link between correct spelling and the use of fluent, joined up handwriting. By learning the movements of common spelling patterns by hand (kinaesthetically) as well as by eye, it was suggested (Cripps & Cox, 1989; Peters & Smith, 1993) that writers improved their chances of producing correct spellings. The popularisation of this theory in schools through spelling and handwriting schemes coincided

with (or caused) a change in the handwriting script of children all over the country.

Handwriting schemes based on this theory advocated the use of an alphabet including exit strokes right from the beginning of writing teaching, and the joining of letters as early as possible (Cripps, 1988). Other work in handwriting at this time (Sassoon *et al.*, 1986) focused on efficiency in handwriting, in particular, the efficiency of letter formation, joins and penhold. The key issue identified by Sassoon and her colleagues was that handwriting was a visible trace of hand movements and that the clarity and fluency of handwriting depended on the learning of efficient movements early in the child's writing experience, as ineffective motor habits were very hard to change. For this reason she suggested that children should learn a clear, simple and efficient handwriting script, including exit strokes, right from the beginning of writing teaching. It was suggested that using such a script from the outset meant that children did not have to un-learn inefficient movements such as stops at the end of each letter, and re-learn an efficient set of movements for joining. This approach was advocated by other authors (Cripps & Cox, 1989). There seemed to be a broad agreement that fluency was important, with Sassoon emphasising the need for children to be able to adapt their handwriting to suit the purpose of the task.

The issue of the degree of joining that should be taught achieved less agreement in schools and in the limited research. Sassoon concluded that joining, where comfortable, helped children to achieve fluent and fast handwriting but cautioned against insisting on joins that caused difficult hand movements. Cripps, however, suggested a fully joined script from the beginning of writing, asserting that it assisted in spacing letters, in ensuring correct formation and assisting children in developing a concept of word. No research basis for these assertions was presented.

Evidence for the degree of change in practice is difficult to find, given the lack of research. However, evidence of practice is reflected in the changes in the resources published. The major handwriting schemes used to teach writing were either replaced or re-written (e.g. Smith & Inglis, 1988) to accommodate this change and even *Words and Pictures*, the flagship British Broadcasting Corporation (BBC) phonics programme replaced the letters used by its 'magic pen' in 1990 to present this formation as it became more usual. This shift found support from those looking at the teaching of handwriting in other countries, such as France (Cotton, 1990), although little was made of the later school starting age in these countries. The available evidence suggests that there are now few schools in England who do not use a script with exit strokes with their pupils. The most recent survey of handwriting pedagogy in England (Barnett *et al.*, 2006) noted that the range of handwriting styles reported, all started with a print script including exit strokes. Although this research included a very small sample, the fact that all current published handwriting teaching materials begin with a script including exit strokes would tend to support the finding.

The late 1980s and early 1990s, therefore, saw a wholesale change to a teaching script including exit strokes in English schools, although there was no national consensus on the degree of joining in handwriting and this is a matter of policy at a school level only. Barnett *et al.* (2006) note that most schools include it in their policies for handwriting. However, there has been almost no empirical research

to examine the claims about the contribution of handwriting to correct spelling, to measure the effects of beginning writing using different scripts or to examine the effects of early joining and Barnett *et al.* (2006) noted, ‘very little awareness of the need to develop flexibility of speed (of handwriting)’ in their recent survey. It seems that a widespread change to a script designed for efficiency was not accompanied by a concern to develop efficiency in terms of speed.

One explanation for such a lack of attention to handwriting, and especially to handwriting efficiency, may have been the perspectives on writing that have been popular in schools and the emphasis these perspectives have placed upon handwriting. In early years education, evidence that, with the right support, children can write meaningful texts before they have mastered the writing system (Teale & Sulzby, 1986) stimulated interest in children’s early attempts at writing (Temple *et al.*, 1982). Authors analysed children’s early writing for evidence of understandings about the language system (Clay, 1975), spelling (Gentry, 1981) and audience (Czerniewska, 1992; Hall, 1987). This produced a pedagogy that came to be called *emergent writing* (Hall, 1987; Teale & Sulzby, 1986) which placed the focus of attention in children’s writing firmly on the meanings children were able to create and the ways they used play for communicative purposes. Children were encouraged to write freely and to use their emerging, but incomplete, understandings of language and writing skills to express themselves in writing. This inevitably created tension between the need to ensure that children developed correct letter formation and the desire to allow them to write unimpeded.

The pedagogy of writing for older children has been shaped by research into writing that stressed the division between the processes of composing text and of transcribing text, dominated by the work of Graves (e.g. 1983) and generally referred to as a ‘process approach’. Graves’ account of the writing process as a series of stages, with the teacher as facilitator, rather than instructor, is echoed in the work of Emig (1988) and Murray (1982). Central to their thinking is the framing of writing as a ‘creative process in which meanings are made through the active and continued involvement of the writer with the unfolding text’ (Emig, 1988). Writing was seen as a largely unconscious process, in which inner thoughts were crystallised into words. Texts such as these have little to say about handwriting, except to emphasise that it is not a significant success criterion in writing.

A composition-led view of the writing process is very much part of the mainstream culture of English teaching, at least in England, and evidence for this may be sought in the policy documents relating to the teaching of writing. The National Curriculum for English (DfEE/QCA, 2000) requires that children be taught to plan, draft, revise, proofread and present their work, a direct reflection of the process approach, and this is sustained in the NLS (DfEE, 1998). Emphasis upon composing may, at times, have drawn attention away from handwriting.

## Research Into Handwriting Fluency

Curiously, there is little evidence that the substantial body of cognitive psychological research on the writing process has had an impact on English classroom practice, despite its empirical rigour and focus on writing process. Much

important research, discussed below, remains largely unknown and its implications for mainstream education unexplored. This may be because psychological research into children's composing processes has been largely experimental and non-naturalist in design, which makes its direct classroom application problematic. However, in psychology, neuropsychology and special needs education research into handwriting efficiency has taken place that may offer insights into the composing processes of mainstream children.

Important research from the field of cognitive psychology has explored the nature of the writing process. Hayes and Flowers' (1980) model of writing gave great emphasis to the recursive, intertwined quality of the writing process. The act of writing was conceptualised as 'the act of juggling a number of simultaneous constraints' (Hayes & Flower, 1980), constraints which could be external, such as the writing task or the intended audience, or internal, such as knowing what to say and how to say it (Sharples, 1999). Scardamalia and Bereiter (1986) also focused upon the cognitive difficulties faced by writers during the writing process, and suggested direct instructional intervention to enable writers to move from knowledge-telling, where they simply linked ideas together in a sequence, to knowledge-transforming, where they shaped their writing to suit audience and purpose. There is also a considerable body of research on the revision phase of the writing process (e.g. Berninger *et al.*, 1996).

In the past decade, significant effort has been devoted to understanding the role of working memory in writing. Long term memory can store virtually unlimited amounts of material for many years. But working memory, which temporarily stores information necessary for carrying out tasks, 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). Kellogg (1999, 2001) and Hayes (1996) both proposed that working memory be included as a central component in models of writing, building on the description of working memory provided by Baddeley and colleagues (e.g. Baddeley & Hitch, 1974; Gathercole & Baddeley, 1993). Understanding the ways different writing processes draw on the same limited working memory resources could explain why some writing processes are more difficult than others and how these processes may interfere with each other. 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. If handwriting consumes a large proportion of working memory capacity it may limit the child's ability to generate ideas, select vocabulary, monitor progress and revise text.

This may be the key handwriting issue for primary schools today. 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). There are a number of ways 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 processes at a pedagogical level and

planning, drafting, revising and publishing have been sequenced as steps in the writing process in many classrooms, in an attempt to reduce their competing demands on young writers. However, the research discussed above suggests that this is unlikely to be a successful strategy at a cognitive level, as writing processes are recursive and closely linked. Moreover, in writing it is hardly possible to isolate or defer the handwriting element of writing, since without it, nothing would actually be written!

Another solution to the problem of competing demands on limited working memory 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 effected 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 working-memory resources, which may explain the correlation between literacy skills and working memory discussed above.

An ambitious programme of structured research undertaken in the last ten years involving cross-sectional, longitudinal and instructional studies (Berninger, 1994; Berninger & Graham, 1998; Berninger *et al.*, 2006) has established that handwriting is far from a purely motor act. A series of studies (Berninger *et al.*, 2006) have examined the way language works with the sensory and motor systems to produce and receive language, identifying four functional language systems: language by ear, language by mouth, language by eye and language by hand, each language system with its own developmental trajectory. Berninger and Graham (1998) stress that writing is 'language by hand' and point out that 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). Although the earliest stages of mark-making involve integrating perceptual and motor skills, later stages of handwriting development rely on coordinating language (names of letters) with writing letter forms. By early schooling, handwriting is an integration of letter forms (orthographic codes), letter names (phonological codes) and written shapes (grapho-motor codes) (Berninger, 2006).

There is a growing interest in the orthographic-motor integration of handwriting – that is the ability to call to mind and write letter shapes, groups of letters and words efficiently and effectively without allocation of cognitive attention. This involves mentally coding and rehearsing visual representations of these patterns and integrating them with motor patterns (Berninger, 1994). There is also a growing body of research, particularly from psychology and work in special education, 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; Graham, 1990; De La Paz & Graham, 1995).

To investigate this issue, studies have tried to remove some of the competing demands for children's cognitive attention during writing and have produced interesting results. De La Paz and Graham (1995) and Reece and Cumming (1996) 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. Other studies have also shown that the elimination of the mechanical demands of writing through dictation resulted in an increase in the amount of text generated by primary aged children (e.g. Hidi & Hidayard, 1984; McCutchen, 1996, 1998; Scardamalia *et al.*, 1982).

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- to 8-year-olds) they studied. 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). However, others indicate that it continues to exert an influence on writing well into secondary school (e.g. Christensen & Jones, 2000; Connelly & Hurst, 2001). Bourdin and Fayol (2002) demonstrated that even in adults, written production of text is still more cognitively costly than oral production.

Given the evidence for the impact of handwriting skills on writers' abilities to generate sophisticated text discussed above, it appears critical that children develop smooth and efficient handwriting. This raises important questions. Firstly, for what proportion of children might inefficient handwriting be affecting their higher order composition? Secondly, is there evidence that handwriting teaching can make a difference in children's performance in handwriting and in composition?

## Handwriting Problems

Questions about the number of children for whom lack of automaticity is a problem are difficult to answer, particularly in England. The statutory tasks and tests undertaken by most children do not assess handwriting speed or provide data that would identify children with handwriting problems, and there is no national screening. In their review of research between 1980 and 1994, Graham and Weintraub (1996) give estimates that between 12% and 20% of school-aged children experience handwriting difficulties, and other estimates, this time for children in England, have been as high as 44% and as low as 13% (Alston, 1985; Barnett *et al.*, 2006; Hartnell, 1994; Rubin & Henderson, 1982). However, as these figures are based on teacher estimates from inadequate samples, they must be viewed with caution. In a longitudinal study of 407 primary school children in Norway, 27% were classified as dysfunctional handwriters at the end of Grade 1 (aged 7), but at the end of Grade 5 (aged 11), only 13% were so classified (Karlsdottir & Stefansson, 2002). Rosenblum *et al.* (2004) asserts that from 10% to 30% of elementary school-aged children have handwriting difficulties, that is 11–12% of female students and 21–32% of male students (cf. Rubin & Henderson, 1982; Smits-Engelsman *et al.*, 1996). If these figures are even approximately correct, it does suggest that lack of handwriting automaticity may be a problem affecting a significant number of primary- and secondary-aged children. Such an unrecognised lack of automaticity may interfere with the composing processes of these children. There is no evidence of concern, screening or intervention about this aspect of writing in England.



There is insufficient data to estimate what proportion of children may be experiencing handwriting difficulties, particularly if these are not the only difficulties they experience in schooling. Nevertheless, the research strongly suggests that boys are more likely to be identified as having a handwriting problem than girls (Hamstra-Bletz & Blote, 1993; Rubin & Henderson, 1982), and research in the 1980s and 1990s confirmed that girls are generally better handwriters than boys (Graham & Miller, 1980), both on measures of overall quality and of letter formation (Hamstra-Bletz & Blote, 1990; Ziviani & Elkins, 1984). Girls also tend to write faster than boys (Berninger & Fuller, 1992; Biemiller *et al.*, 1993; Ziviani, 1984). This is an important detail if handwriting does have an impact on children's ability to compose in the primary years. It may be that boys are less likely to obtain the necessary automaticity in handwriting at the expected age, and that this interferes with their ability to compose (Berninger & Fuller, 1992). At present, there is considerable concern in England about boys' underachievement in writing (UKLA/PNS, 2004). In the annual Standard Assessment Tasks, boys consistently do worse than girls at writing (Bearne & Warrington, 2003) but data does not reveal how handwriting is implicated in this. However, the issue of boys' handwriting has not been a focus of the projects aimed at addressing underperformance in writing by boys. Although a recent project to address boys' underachievement in writing (UKLA/PNS, 2004) noted that the difficulties most often cited by the boys in the study were mechanical aspects of writing – handwriting and spelling. There is a danger that, for some children, handwriting is slower and less automatic than for their peers, and that this in turn creates what Stanovich (1986) has called, in reading, the 'Matthew effect' whereby those who are more able, (usually girls) achieve more successful practice and, in the case of orthographic-motor integration, have more attention available for composing processes. In turn this leaves the less able with less opportunity to engage with higher order composing processes and to make progress in writing. Coupled with this are the motivational difficulties experienced by children suffering from prolonged failure at key tasks like writing.

## **Pedagogic Ways Forward**

Studies of orthographic-motor integration undertaken to find out the effects of focused handwriting practice are, in the light of what has just been discussed, particularly interesting. A number of studies discussed below have measured orthographic-motor integration using an alphabet task designed by Berninger *et al.* (1991) requiring children to write out the letters of the alphabet in order in one minute. This task is also available, in modified form, for teachers (Taylor, 2001). However, the fact that information about performance at different ages is not available for England limits its usefulness in schools.

In a study by Berninger *et al.* (1997), Grade 1 (age 7) children identified as at risk for handwriting difficulties were assigned to one of six intervention groups: five handwriting treatment groups or a phonological awareness treatment condition. Performance on a standardised writing test (of composition, not just handwriting) improved for children assigned to the handwriting groups, but especially for the most successful handwriting group. This group wrote each letter from memory after viewing a model of the letter containing directional

arrows. This study offers further evidence of the role of memory handwriting learning.

Two studies have been undertaken by Christensen (Christensen, 2005; Jones & Christensen, 1999). One study measured the orthographic-motor integration, reading and written expression of 114 children in Year 2 (aged 7) before and after an eight-week long handwriting programme. The children undertaking the handwriting programme showed significant improvement in their handwriting, and crucially, their composing skills. More than half the variance in scores on written expression was accounted for by orthographic-motor integration, even when reading scores were controlled. Christensen reports a study of 50 older children (Years 8 and 9 in secondary school) whose orthographic-motor integration and written expression were measured before and after an intensive handwriting programme. A matched control group did journal writing for a similar period. Although both the journal and handwriting groups were equivalent at pre-test, the scores for the handwriting group after eight weeks of intervention were significantly better on all post-test measures. At post-test, scores for the handwriting group were 70% higher in orthographic-motor integration and 46% higher in quality of written text than for the journal group. The handwriting group also wrote approximately twice as much text as the journal writers. These are impressive findings at a secondary level, where it might be expected that children who have not achieved automaticity would already have experienced demoralising failure. These studies offer convincing evidence that handwriting intervention can make a difference to the handwriting and composition of children who are struggling with handwriting in mainstream classes. By improving their ability to produce letters automatically, these young writers freed up their attention for other writing processes.

## Conclusion

The research discussed above suggests that role of handwriting efficiency in the writing of young children has been underestimated in mainstream education. In concentrating on the possible benefits to spelling of well-formed, joined handwriting, it seems that the necessity for speed and automaticity in handwriting has been neglected in our handwriting pedagogy. Educators have given priority to composing processes in writing, possibly as a corrective to the mores of previous decades. But in doing so, we may have neglected a skill, which contributes to the composing we so value. The research reviewed above suggests that it is time to reconsider.

Handwriting, and in particular automaticity of letter production, appears to play a role in facilitating higher order composing processes by freeing up working memory to deal with the complex tasks of planning, organising, revising and regulating the production of text. In this way, automatic handwriting facilitates composing. Research undertaken into the predictors of writing competence 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; Connelly & Hurst, 2001; Jones, 2004; Peverley, 2006). This is a surprising

finding, especially given the relatively low status and lack of attention given to handwriting in school.

In the educational literature about writing, and enshrined in the English National Curriculum, is the assumption that handwriting will become automatic relatively early in writers' development, freeing up cognitive resources to facilitate composition. This assumption remains untested, as national statutory testing does not assess handwriting speed or fluency and addresses only writing style and neatness. We may be assessing the wrong aspects of handwriting and failing to assess an aspect which is important.

The evidence reviewed above suggests that a significant proportion of children experience handwriting difficulties throughout their schooling. 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. None of the authors of the studies discussed above make exaggerated claims regarding handwriting instruction. It will not solve all the difficulties of writing. However, the evidence reviewed above suggests that it could be helpful to a significant number of young, especially male, writers in our schools.

This research seems to call for a number of responses. We need to examine in more detail whether findings about orthographic-motor intervention can be generalised to the English context. We also need to assess the extent and distribution of handwriting difficulties by looking at levels of automaticity in primary and secondary school pupils. Establishing some benchmarks for orthographic motor-integration through schooling would be the first step towards looking for a screening instrument that could identify children with handwriting difficulties who might benefit from group interventions to improve their automatic production of letters. A research programme to consider what intervention might be most effective, and taking into account work already carried out in other countries (e.g. Berninger *et al.*, 1997; Christensen, 2005; Graham & Harris, 2005; Graham, Harris & Fink, 2000; Jones & Christensen, 1999) using a relatively simple alphabet writing task designed by Berninger *et al.* (1991), could then be undertaken. This programme of research has the potential to benefit young writers, particularly boys, who struggle to compose throughout their primary and secondary schooling.

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