

Teaching and learning writing at primary school:

an exploration of writing environments,
transcription and text generation

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Abstract

Introduction

Children's writing skill continues to cause concern. While research into interventions is on-going, little is known about writing in natural classroom environments or the effects of individual differences on everyday performance. This project examined real-life handwritten work in primary school, focussing on transcription and its relationship with text-generation in different classroom writing environments (i.e. whether content is teacher-determined, child-determined, or generated jointly by teachers and children).

Method

Nine Year 5 teachers were interviewed about their classroom practice, training, and beliefs relating to writing tuition. All handwritten work by 135 children from one week was photographed and transcribed. Amount written and spelling accuracy were compared between children, classes and writing environments. Relationships between transcription and word-level text generation were examined. Compositional quality of child-generated writing was scored and factors drawn from the entire project evaluated as predictors of quality.

Results

The teachers felt that handwriting tuition should occur throughout primary school. Though compositional quality was considered to be more associated with handwriting speed rather than its neatness, teachers emphasised neatness. The most productive child wrote 16 times more than the least. Lower-productivity classes were typified by a greater proportion of teacher-generated writing. Compositional quality and lexical richness of child-generated writing were positively associated with amount of teacher + child-generated writing, but the link with amount of teacher-generated writing was non-significant. Spelling-errors in copying tended to be phonologically implausible whereas in child-generated writing plausible errors were more

frequent. Better genre-writing scores were achieved by children who had written more word-types during preparation for the tasks. Strongest predictors of scores were teachers feeling well-prepared for writing tuition and more recent qualification, and larger amounts of teacher + child-generated writing carried out.

Discussion The national curriculum for handwriting does not require tuition throughout primary school, contrary to motor learning research. More recently qualified teachers were less critical of writing performance being judged against specified criteria than those qualified for longer. Many teachers were unaware of how much copying occurred and copying may be an ineffective means of acquiring vocabulary knowledge; increasing the amount of teacher + child-generated writing may be beneficial. Other theoretical and practical implications are discussed and limitations and future research considered.

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Introduction

Writing is a complex, multi-skilled activity which enables information to be recorded, organised and stored. Access to and progress in many career pathways is influenced by writing ability. Writing skills are learned and culturally-based, and acquisition of writing knowledge is dependent upon dedicated tuition. The aim of the tuition should be to enable production of rapid and legible handwriting, accurate spelling, and high quality composition, through teaching and practice opportunities.

There is, however, international concern about educational attainment in writing. In the UK Key Stage 2 standard attainment tests (SATs) taken by children aged 10-11 years have consistently demonstrated that writing skills lag behind reading and maths: in 2011, 84% of children achieved at least the expected level of performance in reading and 80% in maths, compared with 75% for writing (2011a) and the 2017 result for writing was again lower than in reading and maths (DfE, 2017). In addition, a positive correlation has been identified between Key Stage 2 SATs writing results and grades in English general certificate of secondary education (GCSE) taken at 15-16 years of age (Mourgues, Tan, Hein, Elliott, & Grigorenko, 2016), signifying the ongoing importance of writing skill enhancement. These findings suggest that additional studies into writing tuition and practice across the curriculum are necessary.

Writing skills

Writing skills are commonly classified into three main elements, one involving lower-level processing – transcription (e.g. handwriting), and two incorporating higher-level processing – text generation (e.g. at discourse-level) and executive functions (e.g. planning). All of the skills are dependent on a common pool of working memory, but this resource is of

limited capacity, particularly for children (McCutchen, 1996). The architecture is summarised in the not-so-simple view of writing (Berninger & Winn, 2006); figure 1 shows how transcription, text generation, executive functioning and working memory interact within it.

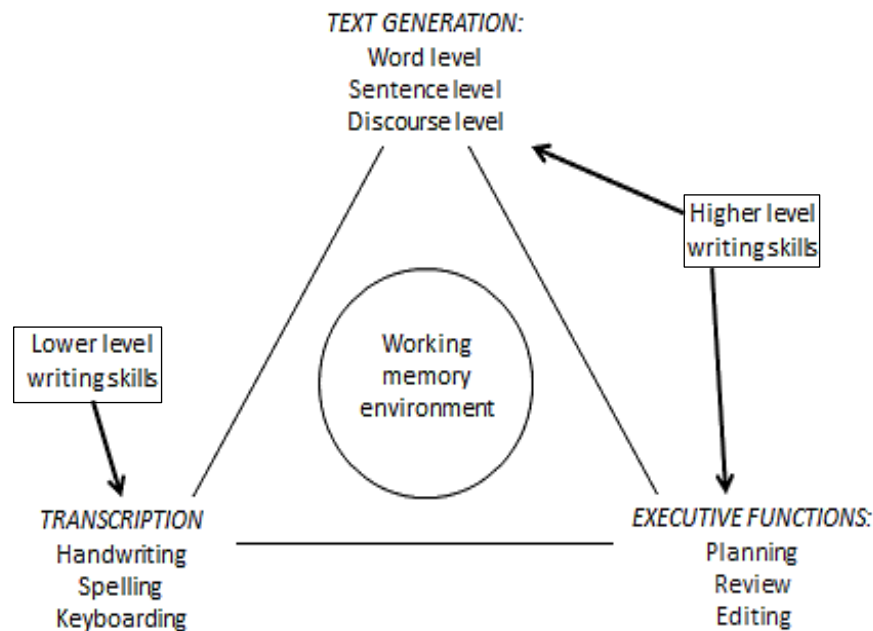


Figure 1 The not-so-simple view of writing
(adapted from Berninger & Winn, 2006)

The not-so-simple view of writing (Berninger & Winn, 2006) and its predecessor the simple view of writing (Berninger & Amtmann, 2003) have often been used as theoretical frameworks in studies of children’s writing (e.g. Kellogg, Olive, & Piolat, 2007; Limpo & Alves, 2013). Their suitability derives from explicit incorporation of transcription, unlike many other theories of writing which focus only on higher-level processing. They are, consequently, particularly appropriate for investigating relationships between children’s transcription skills and higher-level processing. The not-so-simple view of writing and a range of others models of writing are reviewed and compared in chapter 1.

Learning and factors influencing its effectiveness

Learning results in a change in behaviour which is relatively permanent, achieved through creation of long-term memories. Practice is a vital component of learning. If there has been sufficient practice, skills become automatized (performed with little conscious awareness), no longer depending on limited working memory resources but instead utilizing established long-term memories (Fitts & Posner, 1967; McCloskey & Rapp, 2017; McCloskey, Reilhac, & Schubert, 2018; Schmidt, 1975; Schmidt & Lee, 2011). This releases working memory capacity for other purposes. For instance, practice in transcription can improve skills and thus reduce working memory load, freeing resources for the higher-level processing on which compositional quality depends (Berninger & Winn, 2006).

Effective learning relies on deep processing, with integration, reorganisation, elaboration, and re-conceptualisation of knowledge (Foos, Mora, & Tkacz, 1994; Song, 2016; Wittrock, 1989). This is reflected in three theoretical frameworks which are particularly relevant to acquisition of writing skills: the lexical quality hypothesis (Perfetti, 2007; Perfetti & Hart, 2002), dynamic systems theory (De Bot, Lowie, & Verspoor, 2007; Torrents & Balagué, 2006) and the cognitive load theory (Sweller, 1994, 2016).

The lexical quality hypothesis (LQH: Perfetti, 2007; Perfetti & Hart, 2001, 2002) indicates that the effectiveness of vocabulary learning is a function of depth of processing – a product of sufficient availability of orthographic, phonological and semantic knowledge to enable formation of long-term memories. The LQH has been used to predict reading comprehension (e.g. Verhoeven, van Leeuwe, & Vermeer, 2011). Dobbs and Kearns (2016) suggested that it might impact on word generation in writing since self-generated writing is dependent on vocabulary stored in long-term memory.

Dynamic systems theory (De Bot et al., 2007; Torrents & Balagué, 2006) incorporates internal and external constraints in skill development. Internal factors include, for example, cognitive, aptitudinal and biomechanical

maturity, whereas external constraints are task-based or environmental. In terms of handwriting, biomechanical maturity affects skill development, and for any given state of maturity an appropriate learning-environment will promote handwriting skill development.

The cognitive load theory (Sweller, 1994, 2016) specifies that rate of learning is constrained by cognitive load, which may be either intrinsic or extrinsic. Intrinsic cognitive load is a function of the amount of simultaneous processing required; models of writing describe interactions between the multiple skills and are discussed in chapter 1. Extrinsic cognitive load is principally instructional (see chapters 2 and 6) and is malleable through variation in the amount of support provided to students by teachers.

Explicit instruction and copying text illustrate differences in levels of support. In explicit instruction there are clear statements about objectives and the learning is scaffolded through explanation, modelling and teacher-supported practice, with the ultimate goal of achieving mastery (Archer & Hughes, 2011). Explicit teaching is thus characterised by active management of cognitive load and, as discussed in chapter 2, there is widespread acceptance of its effectiveness. Copying requires execution of accurate spelling and legible handwriting from a source which may be remote (e.g. a class whiteboard) with potential teacher-imposed time-pressure; any of these factors might impose significant demands on working memory (Laishley, Liversedge, & Kirkby, 2015). Children may not understand all of the words which they are copying or know their pronunciations, hindering acquisition of semantic and phonological knowledge. Furthermore, letter-position coding is unlikely to be fully developed until the end of primary education and mid-word gaze relocations on longer words in source material may be inaccurate (Castles, Davis, Cavalot, & Forster, 2007) potentially impacting on acquisition of orthographic knowledge.

Writing activities also vary in terms of the balance in autonomy between teachers and children in determining the content of classroom writing. For example, teachers determine the content of copied text, indicating a teacher-generated writing environment (T-gen writing), writing carried out during explicit instruction combines input from both teachers and children, signifying a teacher + child-generated writing environment (T+C-gen writing), and the content of children's productive writing in independent writing tasks is child-determined (C-gen writing). There have been very few attempts to classify the entire gamut of children's everyday writing (although see Brindle, Graham, Harris, & Hebert, 2016; Coker et al., 2016; McHale & Cermak, 1992a) Writing environments are discussed in detail in chapter 6.

In this project, factors influencing learning effectiveness will be described as either internal (i.e. intrinsic or internally constrained) or external (i.e. extrinsic or externally constrained). Examples of internal factors are biomechanical maturity and task complexity, both discussed in detail in chapter 1. External factors include teacher practice and classroom activities (see chapter 2).

Individual differences

It is expected that primary school children in a given school year will achieve marks within a specified band of attainment in each subject area. Nonetheless, children will show a range of performance and some will fall either above or below expectation. Individual differences reflect both internal and external influences and may affect performance.

Writing attainment has been shown to be linked with competence in writing subskills. For example, there is a consensus that there is a substantial positive relationship between transcription and quality of composition amongst primary school children (e.g. Graham, Berninger, Abbott, Abbott, & Whitaker, 1997). Focussing on handwriting, Feng, Lindner, Ji, and Joshi

(2017) conducted a meta-analysis investigating the effect of handwriting fluency on compositional quality for children in Grades K-6 (5-12 years), and identified an effect size of 0.43. Handwriting skill has also been linked with examination performance. Medwell and Wray (2014) demonstrated that children whose handwriting lacked fluency were less likely to achieve the expected level of performance in Key Stage 2 writing SATs than their peers. Montgomery (2008) and Roaf (1998) found that a substantial minority of students continue to experience problems with handwriting after transfer to secondary school. They concluded that these students' copying speeds may be insufficient to cope with the pace of classroom teaching and they may lack capacity to generate sufficient text. Even at first degree level, handwriting fluency was shown to be positively correlated with essay marks in time-pressured examination conditions (Connelly, Dockrell, & Barnett, 2005).

Writing attainment has also been associated with children's age within the school year, gender, qualification for free school meals (FSM), use of English as an additional language (EAL), and having specific educational needs (SEN). For example, older children are awarded higher marks than their younger peers in Key Stage 2 English SATs (Crawford, Dearden, & Meghir, 2007). Girls have been found to outperform boys in writing, ascribed by Williams, Larkin and Blaggan (2013) to the greater richness of the vocabulary girls select. Children who qualify for free school meals (FSM) tend to begin education with smaller vocabularies and perform significantly worse in SATs (Bhattacharyya, Ison, & Blair, 2003; Dehal, 2006). Those who use English as an additional language (EAL) write with less grammatical complexity than their classmates (Cameron & Besser, 2004).

Main aims of the current project

Despite ongoing research, compositional quality of children's writing continues to cause concern. This project examined writing in Year 5 (age 9-10) in order to provide insight into a series of factors influencing performance, including variables which have not previously been investigated. The overall aims were (i) to describe classroom practice in writing in terms of teachers' beliefs and attitudes about writing tuition and the content of students' written production and (ii) to examine the effects of writing environments on the relationship between transcription and quality of text generation.

Literature review chapters

Seven studies were carried out. They are preceded by three literature review chapters. Chapter 1 (Models of handwriting, spelling and writing) describes and compares models of writing, firstly those incorporating both higher and lower processing and secondly theories focussing separately on handwriting, spelling or composition. Chapter 2 (Writing in the classroom) investigates the effectiveness of interventions in tuition of handwriting, spelling and composition through the findings of meta-analyses. Next there is a review of the findings of surveys of teachers providing tuition in handwriting, spelling, and composition. Chapter 2 concludes with an examination of the extent to which teachers were incorporating research-based recommendations into their classroom practice. Chapter 3 (Curricula and assessments) summarises the national curricula (NC) for handwriting, spelling and composition, and describes assessment procedures carried out at the end of primary school in each writing skill.

1 MODELS OF HANDWRITING, SPELLING AND WRITING

Theoretical models of writing are valuable since they provide information about underlying writing skills and cognitive factors which may influence writing performance at school. There is, however, variation between the models. Some emphasise higher-level processing whereas others focus on the limited capacity of working memory available and how this affects simultaneous processing at both lower- and higher-levels. The variation affords different perspectives on both the acquisition and operation of writing skills and considering theories collectively highlights issues about which comparatively little is known. The purpose of the current chapter is to review theoretical models of writing in order to contribute to the design of studies in this project and facilitate interpretation of their findings. The review is complemented by the next chapter in which classroom practice in writing tuition is considered.

Until the second half of the twentieth century, writing was seen as a linear process, as exemplified by the conception/incubation/production model (Britton, Burgess, Martin, McLeod, & Rosen, 1975). Subsequently a more multifaceted analytic framework was conceptualized. The complexity of these more sophisticated models illustrates the high cognitive demand imposed by writing.

This chapter begins with models which encompass the whole scope of writing skills, i.e. transcription, executive functions and text generation. Subsequently, theories which provide more detailed explanations of separate writing subskills (handwriting, spelling and composition) are described and compared.

The not-so-simple view of writing (Berninger & Winn, 2006), summarised briefly above, described writing in terms of three main elements: transcription, text generation and executive functioning. There was also an emphasis on the potential effects on writing production of the limited availability of working memory resources. This section describes two influential models focussing on working memory which preceded the not-so-simple view of writing: the model of working memory in writing (Kellogg, 1996) and the capacity theory of writing (McCutchen, 1996). Subsequently, the not-so-simple view of writing (Berninger & Winn) is re-examined in greater depth.

1.1 Models of writing

1.1.1 The model of working memory in writing

Kellogg's (1996) working memory in skilled writing explicitly focussed on the effect of limited working memory capacity on writing. It was substantially influenced by the model of working memory (Baddeley, 1986), and also the psychomotor theory of writing (Van Galen, 1991) and the Hayes-Flower model of composition (J. R. Hayes & Flower, 1980) both of which are elaborated later in this chapter.

Kellogg's model consisted of six processes, arranged linearly but with feedback at all levels. The initial two were planning (pre-linguistic phase of generating and ordering concepts) and translation (linking knowledge of content, rhetoric, the inner voice, orthography and grammar), both associated with the Hayes-Flower model. Subsequently there were two levels of motor processing, influenced by Van Galen (1991): programming of individual letters and motor execution. The fifth and sixth levels, reading and editing, were again similar to the Hayes-Flower conceptualisation. There may be significant cognitive demands stemming with levels 1, 2, 5, and 6, but Kellogg (1996) concluded that demands imposed by transcription (levels 3 and 4) were minimal.

In his review of research conducted since the 1996 working memory model, Kellogg, Whiteford, Turner, Cahill, and Mertens (2013) considered that the overall architecture of the working memory model remained substantially theoretically intact. Nonetheless, the substantial attentional demands made by handwriting on children and competition between higher- and lower-levels of processing were explicitly recognised.

1.1.2 The capacity theory of writing

McCutchen (1996) proposed the capacity theory of writing to explain writing strategies adopted by less skilled writers. For example, translating text is highly demanding for children, so little working memory may be available for planning or review. McCutchen, Covill, Hoyne, & Mildes (1994) identified that individuals whose working memory capacities were larger produced higher quality text, suggesting that more resources were available for planning and review. McCutchen (2000) highlighted the valuable role played by domain-specific expertise, which automates access to the long-term memory, reducing demand upon working memory. Similarly, writing on a well-known topic should result in comparatively easy retrieval of long-term memories, again releasing resources for high-level processing.

McCutchen (1996) also suggested that the various processes involved in writing do not emerge simultaneously, each taking a different amount of time to become well-established. Capacity to translate ideas into language for transcription is a generalization of speech production practised since infancy. In contrast, transcription involves novel skills and it imposes highly significant cognitive costs on children. For example, Bourdin and Fayol (1994) found that children aged between 7 and 10 years had higher scores in word-recall tests when these were tested using speech rather than handwriting whereas there was no effect for adults. Similarly, Dockrell and Connelly (2016), and MacArthur and Graham (1987) reported that the quality and length of oral narratives exceed those of written compositions until children reach the age of 10. However, despite the demands exerted by

transcription, translation nonetheless takes longer to become fluent.

McCutchen, Covill, Hoyne, and Mildes (McCutchen et al., 1994) concluded that it continued to impose demands for students at least throughout the range from Grades 3 to 8 (8-14 years).

1.1.3 The simple and not-so-simple views of writing

Berninger et al. (1992) were concerned that certain aspects of writing development were not fully explained in models in which well-developed lower-level writing skills were assumed or ignored. Furthermore, they concluded that translation should be divided explicitly into text generation (ideas translated to language) and transcription (translating language into writing).

Berninger and Amtmann's (2003) simple view of writing includes transcription (handwriting, spelling and keyboarding), text generation (word-, sentence- and discourse-level) and executive functioning (planning, viewing and revising), all dependent on a common resource of working memory. Berninger and Amtmann's initial model was later modified by Berninger and Winn (2006) to the not-so-simple view of writing. In this, more detail was provided about executive functions and working memory. Executive functioning was described in terms of control of attention: selection, inhibition, switching, and maintenance, and also cognitive engagement and both metalinguistic and metacognitive awareness.

In the not-so-simple view of writing, working memory was described as having dual functionality. Firstly there was access to long-term memory to facilitate planning, composition, reviewing and revising, along with short term memory for reviewing and revising. Secondly there was capacity for temporary manipulation of information, for example the phonological loop sustained the activation of verbal information in working memory and an orthographic loop supported learning of spelling. Together these were the 'working memory environment'. Similarly, Adams, Simmons, Willis, & Porter (2013), Chenoweth and Hayes (2003) and Torrance and Galbraith

(2006) have suggested that in self-generated writing a phonological ‘inner voice’ stores narrative content immediately before it is committed to paper.

If there is an interdependence between transcription, executive functions and text generation on a limited supply of working memory, this should be evident in studies of transcription and compositional performance. Graham et al. (1997) investigated the relationships between handwriting, spelling and compositional quality in grades 1-6 (6-12 years). They found that transcription skills accounted for 42% of the variability in compositional quality in Grades 4-6. Medwell, Strand, and Wray (2009) measured handwriting fluency and neatness for children aged 10-11 years and compared them with Key Stage writing SATs results. Both predicted compositional quality although fluency had a stronger effect. Subsequent studies have provided further evidence of the relationship between transcription and text generation (e.g. Alves, Branco, Castro, & Olive, 2012; Graham, Harris, & Fink, 2000; Limpo & Alves, 2013).

Dockrell, Marshall, and Wyse (2016) commented that although the simple and not-so-simple view of writing models capture an overview of writing, there are omissions and simplifications. For example, they highlight the omission of punctuation, which could be considered both as a transcription skill and also as an enabler of clarity of expression - thus linked with executive functions. Similarly, morphemic knowledge is a component of transcription and text generation. Another limitation is that although the simple and not-so-simple view of writing models are intended as developmental models they do not describe the processes of developmental changes.

1.1.4 Summary – models of writing

The simple and not-so-simple views of writing, along with the model of working memory in writing (Kellogg, 1996) and the capacity theory of writing (McCutchen, 1996) explicitly incorporate lower- and higher-level processing. As such, they provide a framework for conceptualising the competing demands for working memory deriving from these different

aspects of writing. The simple and not-so-simple views of writing also subdivide transcription into spelling and handwriting, and text generation into word (vocabulary), sentence (grammar) and discourse (composition). However the relationships between handwriting and spelling, or those between either aspect of transcription and text generation – whether at word-, sentence-, or discourse-level are not all well-understood.

1.2 Writing subskills

Writing subskills are separated into handwriting spelling and composition in this section.

1.2.1 Handwriting

Two dominant models of handwriting, the psychomotor theory of writing (Van Galen, 1991) and the kinematic theory of rapid movements (Plamondon, 1995; Plamondon & Djoua, 2006) are reviewed below.

Although both incorporate handwriting into the writing process as a whole, motor control is the principle focus. Each model was originally intended to describe processing by skilled writers – i.e. without disproportionate reliance of handwriting on working memory reserves or biomechanical maturity. Subsequently, potential explanations offered by theories of motor-learning are considered for the mechanisms. In addition, evidence related to a possible time-frame over which handwriting skills become sufficiently well-developed to adopt an adult profile is considered.

1.2.1.1 The psychomotor theory of writing

The psychomotor theory of writing (Van Galen, 1991) specifies that writing is a hierarchical procedure with parallel processing of successive units of communication through a series of seven levels, with temporary storage in working memory between each as necessary. The upper levels (ideas, concepts, phrases and words) were incorporated from Levelt's (1989) model of speech production. Subsequently there is the first writing-specific level – spelling. The three lowest levels concern motor control in handwriting.

The first is selection of allographs and activation of the relevant motor programs. The second is monitoring of letter size and speed. The final level is the recruitment of specific agonist and antagonist muscle pairs to enable realization of the desired trajectory in the current environment.

In a revision of the psychomotor theory of handwriting, Kandel, Peereman, Grosjacques, and Fayol (2011) proposed additional processing between words and allographs, i.e. for syllables and letters. Subsequently, Kandel and colleagues have suggested possible parallel activation of morphology, doubled consonants and syllables, with potentially large cognitive demand. This may incorporate simultaneous analysis of individual letter streams according to different types of sublexical units (e.g. syllable and morpheme). There remains, however, a lack of knowledge of the multifaceted interaction between spelling and handwriting, particularly in the context of everyday classroom writing.

Whilst the psychomotor theory of writing was not intended to describe development of writing capability, its architecture provides information about learning and individual differences. Firstly, there is a sequence of writing sub-skills, initiating with idea generation and finishing with moving the pen across the writing surface. It is necessary for all of these skills to be well-developed in order to enable fluent writing. Individual factors may impede capability in specific sub-skills and written performance is only fluent if each of these has been sufficiently automatized that there is minimal requirement for working memory resources. Secondly, processing of a subsequent idea initiates before the first has been committed to paper – i.e. there is parallel processing, signifying the complexity of writing and handwriting. This has important consequences in terms of accumulated cognitive demand and resulting effects on automaticity (Bogaerts, Meulenbroek, & Thomassen, 1996; Kellogg, 1996; Kellogg et al., 2013) especially for children, whose working memory capacity is more limited. Overall, as a complex skill, handwriting imposes significant cognitive load.

1.2.1.2 The kinematic theory of rapid movements

The kinematic theory of rapid movements (Plamondon, 1995; Plamondon & Djioua, 2006) incorporates a sequence of processing levels which map closely onto those in the psychomotor theory of writing (Van Galen, 1991), but with additional detail associated with motor execution. As handwriting skills improve, pen-tip trajectories become increasingly smooth, measured by calculating numbers of inversions of the pen-tip velocity profile (fewer inversions indicating greater skill). The kinematic theory of rapid movements incorporates a complex mathematical model of handwriting movements. This has enabled mapping of the development of children's handwriting skills. It was concluded that children do not have well-developed distal neuro-muscular control until at least 10 years of age (Plamondon, O'Reilly, Rémi, & Duval, 2013).

1.2.1.3 Models of motor learning and the acquisition of handwriting skills

Various models of motor learning clarify the acquisition of handwriting skills, suggesting mechanisms, developmental changes and approximate time-scales. Fitts and Posner's (1967) model describes progress towards automatization. The initial phase, cognitive, concerns understanding the intended movement, for example comprehension of letter forms. In the associative phase, both accuracy and speed of performance increase, as a consequence of practice. For complex tasks such as handwriting this stage may last for several years. In the autonomous (i.e. automatized) phase, the activity can be performed with little conscious awareness although speed may continue to increase. In terms of writing, this enables individuals to divert attention away from focussing on handwriting accuracy towards text generation and executive functions.

Bosga-Stork (2016) investigated spatial and temporal restraints on loop execution (as in cursive curved 'l') by Grade 1 children (6-7 years) and concluded that there was evidence of conscious cognitive control. Graham, Berninger, Weintraub, and Schafer's (1998) findings reflected the

associative and autonomous phases of Fitts and Posner (1967). They showed that while handwriting legibility had peaked (suggesting the culmination of the associative phase) in grades 5-6 (10-12 years), participants did not reach the speeds of typical adult automatized copying until Grade 9 (14-15 years).

The schema theory of discrete motor skill learning Schmidt (1975) provides a mechanism for handwriting skill acquisition. This model incorporates learned generalized motor programs (GMP, abstract long-term memory representation of a class of movement) and McCloskey, Reilhac, and Schubert (2018) concluded that changes in writing behaviour resulting from acquired dysgraphia may be a consequence of incomplete activation of previously established GMPs. In addition, there are schemas (rule system scaling actions in time and space, reflecting the final two levels of the psychomotor theory of writing). Acquisition of GMPs and schemas is practice-dependent.

Before GMPs are established, motor control occurs via a feedback mechanism which depends on online perception of sensory stimuli and is cognitively demanding (Teulings, 1996). Chartrel and Vinter (2006) found that children aged 10 years were significantly more dependent on visual feedback than adults when performing handwriting movements, suggesting their continuing reliance on feedback control. This reflects Palmis, Danna, Velay, and Longcamp (2017) and Plamondon et al. (2013) who concluded that neuromuscular control was not yet mature until at least 10 years. In addition, Graham, Berninger, Weintraub, et al. (1998) found that handwriting accuracy improves until 10-12 years suggesting lack of automatization until that age.

Feedback control places extensive demands on working memory, with resulting potential for cognitive overload. In addition, it is restricted by rate of sensory perception (150-250 ms, Kawato, 1999). If movement duration is shorter (e.g. for skilled hand-writers, the duration of handwriting strokes is 100-150 ms), sensory monitoring is unworkable (Schenk, Walther, &

Mai, 2000). In consequence, once a GMP has been learned feedback-control is replaced by feedforward control. Feedforward control is a feature of automaticity and less cognitively demanding than feedback control, and working memory resources are released for other purposes such as text generation and executive functions. However, as control transfers away from feedback control a possible consequence for handwriting is that accuracy (i.e. conformity with required school style) may decline since online correction using sensory feedback is no longer possible.

The effect on GMP consolidation if children are required to modify handwriting style as they progress through stages of skill acquisition is not well understood (see e.g. Bara & Morin, 2013). Handwriting styles range from un-joined to fully cursive. In France all children learn a national cursive handwriting style whereas in England it is merely required that writing styles should enable efficient joining between letters. If children are required to transition from un-joined to cursive, or between styles favoured by individual teachers as children through school, this may have an impact on the rate at which GMPs become established.

Dynamical systems of motor control offer a different perspective on skill acquisition with efficient stable movements emerging from self-organisation rather than being pre-programmed (i.e. are not GMP-dependent).

Handwriting involves two types of movement. Spatial layout of characters and their size are associated with topokinetic movements in the arm in proximal joints, and letter shape generation with morphokinetic movements (distal joints). Charles, Soppelsa, and Albaret's (2004) findings indicated that there is marked improvement in topokinesis during Grades 1-2 (6-8 years). In contrast, maturation of morphokinesis does not tend to occur until at least 10 years (Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013). These conclusions reflect Bernstein's (1967) model of motor learning which commences with minimal independence of joints, reflected in the large movements typical of young children's handwriting with the arm and hand moving as a single unit operated from the shoulder. Next

there is progressive freeing of the movement and emerging fine motor control, allowing increase in handwriting speed and accuracy. Finally there is full control of degrees of movement, with strategies appropriate for current environmental conditions, echoing schemas in cognitive motor learning theories.

Combined, these models of motor learning promote understanding the acquisition of handwriting skills. Initially there is a high level of cognitive demand as letter shapes and movement directions are learned. Children are restricted to online feedback control because GMPs are not yet established although topokinetic control improves significantly by 7 years. Large numbers of inversions of velocity indicate that children are not yet approaching automaticity, and cognitive overload deriving from handwriting reduces pen-tip speed and limits capacity for parallel processing at higher levels.

Once cognitive knowledge has been internalized, children reach the associative phase of learning and speed and legibility of handwriting increase. GMPs are laid down and the number of inversions of velocity peaks reduces. Cumulative processing demands imposed by handwriting may still periodically generate cognitive overload, reducing output speed. Morphokinetic control is not yet well-established due to continued lack of maturity of neuro-muscular systems (Plamondon et al., 2013), and there is still reliance on feedback control.

In the autonomous phase, the majority of control occurs via feedforward processing (characteristic of automatization), reverting to feedback control only when cognitive demand rises (e.g. requirement to write neatly). There is reduced demand for working memory, allowing attention to be diverted towards other writing objectives, for example higher levels in the psychomotor theory of writing (Van Galen, 1991). Converging evidence (e.g. Chartrel & Vinter, 2008; Graham, Berninger, & Weintraub, 1998; Palmis et al., 2017; Plamondon et al., 2013) suggests that automatization is unlikely before at least 10 years of age.

1.2.2 Spelling

Alongside handwriting, spelling is a component of transcription. Like handwriting, until skills are well developed spelling imposes considerable cognitive load due to its complexity. In addition, as evident in specific learning difficulties such as dyslexia, individual differences in processing capability in the component sub-skills may have significant effects on learning efficiency. Furthermore, acquisition of spelling and handwriting skills occur in parallel, exerting simultaneous demand for working memory resources.

Spelling draws on a variety of sources of information and these are language dependent. Languages such as Finnish, have shallow orthographies (on or about a one-to-one phoneme-to-grapheme relationship) (Seymour, Aro, & Erskine, 2003). Children learning these languages acquire literacy skills quickly since this single source of information is dependable. In contrast, in languages with deep orthographies spelling imposes a greater cognitive load. Individual phonemes are represented by a number of different graphemes, which may be complex i.e. more than one letter long, and graphemes which may signify more than one phoneme. In addition, English is a morphophonemic language (vowel pronunciation and spelling altering when morphemes are attached) and with diverse etymology, both of which increase the complexity of spelling. The consequence is the necessity for parallel processing of several strands of information, as described by Kandel and colleagues. Seymour et al. (2003) described English as having the deepest orthography of the 14 European languages investigated, gauged using duration of the skill acquisition period.

Models of spelling vary in terms of the number of sources of information used to predict spellings and the degree of necessity for rote learning. It was long considered that learning spelling in English was only possible through memorization of whole words (Sloboda, 1980) owing to its irregularity. However, this was called into question by Venezky (1970) and others who suggested that words lie on a spectrum of regularity. Dual-route theories of

spelling combine phoneme/grapheme knowledge with a requirement for memorization of irregular words whereas more contemporary models incorporate a broader range of sources of information to enable understanding of spelling patterns. Both types of models have influenced the UK national curriculum for spelling.

1.2.2.1 **Dual-route theory of spelling (Barry, 1994; Kreiner & Gough, 1990)**

The dual-route theory incorporates two processing routes: lexical and non-lexical (reflecting the dual-route theory of reading, Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001). The first route is used for words already stored in the orthographic lexicon (i.e. long-term orthographic memory), is whole-word based, and its operation is not dependent on orthographic regularity. In order for words with atypical phoneme/grapheme correspondences to be stored in long-term memory, learning requires memorization. The second route enables spelling of unfamiliar words using a sequence of rule-based phoneme/grapheme correspondences. This may result in a comparatively large demand on working memory resources. A possible consequence of the non-lexical route is generation of spellings which are incorrect but nonetheless phonologically plausible.

1.2.2.2 **Stage and phase theories**

Ehri and Wilce (1985), Frith (1985) and Gentry (1982), proposed that children pass through a series of learning stages or phases while acquiring spelling knowledge: first phonological, next orthographic, and subsequently morphological. However, as summarized in Daffern (2017) and Treiman (2017), types of spelling errors made do not show distinct shifts as a child progresses from one stage to the next. This has led to the proposal of multiple resource theories in which knowledge resources are utilized in parallel.

1.2.2.3 **Multiple resource theories**

Multiple resource theories explicitly incorporate several strands of information. While this takes into account the depth of English

orthography, such an approach may increase cognitive load owing to increase in amount of parallel processing. However, should there be differences in processing capability in specific spelling subskills, use of additional sources of information provides for alternative spelling strategies.

Triple word form theory

According to Berninger, Garcia, and Abbott (2009), phonology, orthography and morphology all contribute simultaneously to spelling development. Children are aware of these knowledge sources from an early age and different forms of knowledge may be used within single words (Berninger, Abbott, Nagy, & Carlisle, 2010; Richards et al., 2006).

Triple word form theory is based on cross-mapping between linguistic entities to enable the formation of stable representations (Bahr, Silliman, Berninger, & Dow, 2012; Garcia, Abbott, & Berninger, 2010).

Phonological mapping is a combination of phonological awareness and encoding using phoneme/grapheme associations. Orthographic mapping incorporates visual awareness and graphotactic conventions, i.e. the outer, visual form. Morphological mapping requires awareness and manipulation of morphemes – the smallest units of meaning. Specific instruction in each type of knowledge is necessary.

The integration of multiple patterns framework

The integration of multiple patterns framework (Treiman & Kessler, 2014) promotes awareness of patterns and generalizations. It combines factors deriving from several models – not only stage and phase theories, but also connectionist frameworks which provide a means of implicit statistical learning via networks of simple units (Seidenberg, 1997). Spelling knowledge is developed through both deterministic and statistical learning.

There are two types of pattern. The first concerns symbol knowledge – identities of letters and graphotactic conventions. Children start to acquire this knowledge before understanding the second form of pattern: linkage between letters and language, including both phonological and

morphological configurations (Treiman, 2017). Patterns reduce arbitrariness and are most effective when several converge (de Bree, van der Ven, & van der Maas, 2017). They also assist if there are incomplete representations. Their effect is to reduce demand on working memory. However, depth of orthography is likely to impact on learning efficiency since patterns are less predictable in languages with deep orthographies.

Statistical learning of spelling patterns occurs as a consequence of multiple observations (via observation in reading and also while writing). This implies that non-structured practice is a necessary component of learning. Learning is also a consequence of instruction relating to rules, provision of explanations and feedback. The result of instruction is reduction in the number of observations which need to be made, i.e. increase in efficiency of learning.

1.2.2.4 Summary

Learning to spell was originally conceived as a process of memorization but models of spelling development have become increasingly complex. Dual-route theories of spelling are based on the concept of lexical vs. non-lexical processing. Words already stored in long-term orthographic memory are processed via the lexical route. Non-lexical processing is used for unfamiliar words and is likely to be more demanding on working memory since it requires use of a series of phoneme/grapheme correspondence rules for each word. Stage and phase theories suggest a linear progress through acquisition of phonological, orthographic and then morphological knowledge. More recently, multiple resource theories conceive spelling as involving parallel processing of information from different sources. Since spelling is complex it is likely to be very demanding on working memory resources until a range of spelling strategies have become automatized.

1.2.2.5 Associations between spelling and handwriting

Spelling skill acquisition, whether as outlined in dual route models of spelling, triple word form theory or the integration of multiple patterns framework, is necessarily cognitively demanding because it involves

integration and elaboration of knowledge deriving from several sources. Such processing necessitates devotion of significant working memory resources. As previously described, handwriting skill acquisition also exerts an appreciable cognitive burden, and spelling and handwriting tuition occur over the same time-span. There is a consequent risk of cognitive overload impeding learning. Despite this factors, little is known about the interaction between spelling and handwriting.

The psychomotor theory of writing (Van Galen, 1991) and kinematic theory of rapid movements (Plamondon, 1995; Plamondon & Djioua, 2006) both incorporate a spelling level preceding the motor levels involved in handwriting. In addition, both theories incorporate parallel processing. There is evidence that central processing of spelling (selecting and activating orthographic representations) cascades onto movement production (selecting and activating motor programs) (Kandel et al., 2011; Lambert, Alamargot, Larocque, & Caporossi, 2011; Roux, McKeef, Grosjacques, Afonso, & Kandel, 2013) resulting in simultaneous processing of spelling and handwriting production.

Before transcription is automatized, one strategy for managing cognitive demand is increased temporal separation of the processing of spelling and handwriting, in order to reduce concurrent load. The behavioural consequence is greater latency between stimulus presentation and initiation of pen-movement. Kandel and Perret (2015) and Afonso, Suárez-Coalla, González-Martín, and Cuetos (2018) examined handwriting/spelling relationships during the period when handwriting skills are approaching automaticity (8-11 years, and 7-12 years respectively). In both investigations, latencies were longer for younger children, but levelled out as age increased, suggesting a tendency towards adult transcription strategies. Similarly, writing durations were longer for younger children, but did not differ for children aged 9-10 years or older, consistent with maturation of morphokinesis at this age (Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013).

1.2.3 Composition

The compositional quality of writing depends on higher-level processing – the generation of text, guided by executive functions such as planning and review. Unlike handwriting and spelling, whose demands on working memory can be reduced through automatization, cognitive load exerted by compositional writing has the potential to remain significant even for highly skilled writers (Kellogg et al., 2007). These effects may be compounded by individual factors, for example children using EAL may have reduced resources of vocabulary.

1.2.3.1 Hayes-Flower model of composition

J. R. Hayes and Flower (1980) were amongst the first writing theoreticians who diverged from stage models of writing. Composing was seen as problem solving and they created a complex model in which they specifically sought to separate individual sub-processes.

The original model comprised the task environment, the writer's long-term memory, and the writing process. The task environment combined the assignment and what had been written so far. The writer's long-term memory stored knowledge of content, writing processes, genre and audiences. The writing process incorporated planning (goals and generation of ideas), translation (ideas converted into language), and reviewing (judging the match between writing goals and product, and editing as necessary). Unlike stage models of writing, planning, sentence generation and reviewing could occur at any stage. Skilled writers were engaged in continual modification and elaboration of goals. In contrast, novice writers generated answers solely for the purpose of meeting the original goals.

Subsequently there have been a series of modifications. For example, planning and reviewing both came to be viewed as complex entities which might involve the entire writing process. The necessity of practice was highlighted in J. R. Hayes and Nash (1996) to promote effective writing strategies, text evaluation skills, and genre knowledge (practice in transcription was not mentioned). In addition, J. R. Hayes and Chenoweth

(2006) emphasised the role of verbal working memory in the process of translation – the inner voice.

The latest model of writing composition (J. R. Hayes, 2012) is divided into three layers: control, process, and resource. The control layer comprises writing motivation, goal setting, and genre knowledge acting in parallel with the writing plan. The process level is split into writing processes and the task environment. The writing processes include the proposer (idea generator), translator (semantics and syntax) and transcriber (conversion to written format), all overseen by the evaluator, supervising revisions as necessary. The task environment incorporates task materials, planning, collaborators and critics, the partially completed writing task, and technology. The third level comprises resources available for the control and process levels: working and long-term memory, attention and reading comprehension.

1.2.3.2 Knowledge transforming and knowledge telling

Bereiter and Scardamalia (1987) proposed two models of writing, one for skilled writing and the other illustrating the strategies of individuals whose skills are less developed. The models were stimulated by interest in knowledge retrieval. They distinguished between ‘knowledge’ and ‘knowledge about knowledge’. The latter was conceptualized as the capacity to identify and activate separate stores of knowledge which are appropriate for a writing task.

In knowledge transforming, following mental representation of a task (i.e. problem), analysis enables creation of writing goals and the outcome feeds into two problem spaces: content and discourse. Each draws on relevant aspects of long-term memory and a reciprocal relationship develops between content and rhetoric: problem translation. After sufficient problem translation, both problem spaces input into knowledge telling (i.e. transcription) from which there is feedback into problem analysis as necessary. This model of skilled writing emphasises extensive higher level

reflection. Successful knowledge-transforming writing not only meets the needs of the reader, but also enhances the understanding of the writer.

The knowledge telling process is supported solely by content knowledge and discourse knowledge (omitting goal-setting, content and rhetorical problem spaces, and problem translation between the problem spaces). It enables production of potentially well structured text despite circumventing the parallel cognitive demands in knowledge transforming. Once the writer has formed a representation of the assignment given, he or she moves directly to the identification of the appropriate genre and suitable topic areas. Information is collected from content knowledge and, if judged relevant, transcribed. This process repeats, with the sentence just written, the topic area, and/or the writing genre stimulating retrieval of further items of information. Once knowledge is exhausted, the writing ceases. McCutchen et al. (1994) described knowledge telling as an adaptive response to limited cognitive capacity.

J. R. Hayes (2011) suggested that in order to trace the developmental path of writing skills, it was necessary to sub-divide knowledge telling into three stages. These had in common a goal (e.g. topic and genre), proposition (generation of ideas, translation into language), transcription (to written language), and termination (time available and goals fulfilled).

The models formed a developmental series. The first describes the creation of flexible-focus text in which the initial focus is the task as set but as each new unit of text is written the focus shifts. The next stage is composition of fixed-topic text (predominating for the majority of primary education) in which all statements refer directly to the task. Maintenance of attention on a single topic depended on re-reading. The third model depicts topic-elaboration in which attention may temporarily be diverted to a sub-topic but when that is completed, the writer returns to the main topic or a different sub-topic. Numbers of clauses used, an indication of writing quality, increases. Overall, organisation moves from local to global.

Together, the Hayes-Flower model of composition (J. R. Hayes & Flower, 1980) and knowledge transforming and knowledge telling (Bereiter & Scardamalia, 1987) provide elaborate depictions of higher-level processing in writing. These provide a crucial insight into writing and aid interpretation of compositional performance. However, neither transcription nor the interactions between it and higher-level processing are addressed. This is of particular importance for younger writers whose transcription skills are not yet well-established. Learning, whether related to higher or lower processing levels, imposes significant demands on cognitive capacity. If either or both of handwriting and spelling are not yet well-established, working memory availability for higher-level processing is restricted, as concluded by Graham et al. (1997) in their investigations of performance capability in transcription and compositional quality of writing.

1.2.3.3 **Summary**

The Hayes-Flower model of composition (J. R. Hayes & Flower, 1980) and knowledge transforming and telling (Bereiter & Scardamalia, 1987) focus on higher-level processing in writing rather than transcription. Since transcription is an important facet of this project, the not-so-simple view of writing (Berninger & Winn, 2006) provides a more suitable overall framework. However, their conceptualisation of writing as a problem solving process and focus on recursive processing involved is important when considering, for example, planning and genre-knowledge.

1.3 Key points and conclusions

Writing enables knowledge to be recorded, organised, stored and created. It is vital not only in education but also many careers, but there is continuing concern about standards of attainment achieved by children and students. Writing is a complex system incorporating many subskills, typically grouped into transcription, executive functioning and text generation. In

order to gain insight into writing difficulties and possible means of addressing them, it is necessary to draw on a broad range of theoretical conceptualisations of writing as a whole and also each of the groups of writing subskills – handwriting, spelling and composition.

Together, writing skills are dependent on limited resource of working memory, as depicted in the not-so-simple view of writing (Berninger & Winn, 2006), the model of working memory in writing (Kellogg, 1996; Kellogg et al., 2013) and the capacity theory of writing (McCutchen, 1996). Each provides a framework which incorporates the concurrent demands made upon working memory deriving from both lower and higher-level processing. However, the mechanisms via which individual writing skills interact are not sufficiently developed to enable comprehensive understanding of writing performance. For example, handwriting and spelling skills have been demonstrated to predict compositional quality (Graham et al., 1997), but it is not known whether differences between children in amount of every day handwriting practice occurring are reflected in quality of text generation.

The psychomotor theory of handwriting (Van Galen, 1991), its revision by Kandel et al. (Kandel et al., 2011) and the kinematic theory of rapid movements (Plamondon, 1995; Plamondon & Djioua, 2006), while focussing on handwriting, set it into the entire process of composition. Each emphasises the effect of the limitation in the resource of working memory in a system with parallel processing, with the potential consequence of cognitive overload deriving from any level. However, since most spelling is realized through handwriting, knowledge of the interrelationships between handwriting and spelling remains incomplete.

Models of motor-learning emphasise the necessity for practice in order to achieve well-developed skills. This is realised in part through transition from reliance on feedback control of movement to feedforward, which release working memory resources for other purposes. In addition, converging evidence suggests that sufficient capacity for the extent of distal

fine-motor control necessary to enable automatization of handwriting is not developed until at least 10 years for most children (Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013). Together, these factors suggest that dedicated tuition and practice opportunities for handwriting should be timetabled throughout primary school. Despite this, little is known about whether current models of motor learning are reflected in teaching policy and classroom practice, for example the amount of cross-curriculum writing which occurs.

Several important concepts derived from the series of models of spelling which have been proposed over time. One is differentiation between non-lexical processing for unfamiliar words which may place appreciable demands on working memory vs. lexical processing of words already stored in orthographic long-term memory. Secondly is the parallel processing of information from several sources suggested in multiple resource models of spelling, suggesting that spelling may continue to require extensive cognitive resources until strategies are well-developed. Due to the variations in models of spelling, a variety of methods for analysing spelling errors have been developed. Choice of method is likely to be determined by research questions.

The Hayes-Flower model of composition (J. R. Hayes & Flower, 1980) and knowledge transforming and knowledge telling (Bereiter & Scardamalia, 1987) revised theoretical conceptions of writing away from the previous notion of a simple linear process to one in which the complexity of higher-level processing was recognised. However, the role of working memory is not specified.

Learning efficiency is influenced by both internal and external factors. Chapter 1 focussed on internal factors – individual factors in writing achievement and the potentially large cognitive load imposed by each facet of writing, especially during skill acquisition. Chapter 2 continues this exploration of the teaching and practice of writing by examining external influences on performance.

2 WRITING IN THE CLASSROOM

Writing provides the principal means of recording, organising and internalising information across the curriculum. In order to achieve these ends, it is necessary to acquire the writing skills utilized during transcription, text generation and executive functioning.

Learning, whether skills or curriculum knowledge, is influenced by internal factors such as task complexity and maturity of motor control, as examined in chapter 1. It is also affected by external factors, for example classroom practices: these are discussed in the current chapter. Effective management of cognitive load in the classroom is likely to increase rate of learning (Sweller, 1994, 2016) and design of instructional and practice conditions is particularly important for learning of complex skills, for example writing subskills.

Chapter 2 examines external influences on learning efficiency through two lenses. The first is via systematic reviews and meta-analyses of teaching interventions, commonly involving explicit instruction (Archer & Hughes, 2011). The second is scrutiny of teacher survey findings, including evaluation of the extent to which research-based teaching recommendations are used in classrooms.

2.1 Meta-analyses of writing interventions

Teaching interventions are intended to promote learning of skills or knowledge. Interventions range from specific activities (e.g. children with writing problems practising through tracing letters), through classroom procedures (such as collaboration with peers or peer-evaluation), to teaching-environments (for instance use of explicit instruction).

Research investigating the effectiveness of interventions have utilized a variety of designs. Some studies have examined outcomes when participants are exemplary teachers. However, as commented upon by Graham, Harris, and Chambers (2016), while the findings may provide valuable insights they may not generalize to other teachers. A more valid estimate of the effectiveness is obtained through intervention studies, in which amount of learning achieved in one condition is compared with the amount following another.

Once sufficient intervention studies have been carried out, systematic reviews and meta-analyses become feasible. This represents the highest level in the hierarchy of research evidence. While there have been more than 20 meta-analyses of compositional writing interventions, indicating a sizeable research base, the amount of research into transcription has been more limited. The findings of three recent systematic reviews and meta-analyses are compared here: handwriting (Santangelo & Graham, 2016), spelling (Graham & Santangelo, 2014), and a meta-analysis of meta-analyses of writing, centring on composition (Graham & Harris, 2017) (see table 1).

Every study contributing to these meta-analyses was coded by, for example, grade levels, student profile (with or without writing difficulties) and length of intervention. Study quality was estimated using indicators such as design quality, intervention fidelity and floor/ceiling effects. In addition, there was double coding for at least 50% of the studies. Average weighted effect sizes (ES), confidence intervals and significance were calculated. In addition, fail-safe Ns were calculated to estimate the number of missing or additional studies needed to reverse a statistically significant finding and moderator analyses were calculated if average weighted ES exceeded sampling error. The meta-analysis authors interpreted ESs greater than 0.25 as being of practical importance, based on the US Department of Education, Institute of Education Sciences' (2014) guidelines.

A limitation of meta-analysis is that since specific questions are posed, not all potential areas of interest may be incorporated. In consequence, following the exploration of the meta-analysis findings presented here, some supplementary evidence is considered, for example relating to copying and tracing. The findings from these additional studies should, however, be regarded with caution since there is, as yet, insufficient evidence to justify consideration of policy changes.

2.1.1 Handwriting

Santangelo and Graham (2016) investigated whether handwriting instruction promoted fluency and legibility of writing, and if such instruction improves compositional quality. In addition, they calculated effect sizes for the types of instructional procedures which have previously been investigated (e.g. explicit teaching, use of technologies such as word processing, and self-evaluation).

As shown in table 1 quite a range of handwriting interventions have been investigated. The strongest positive effects related to explicit handwriting instruction promoting length and quality of composition. In contrast, motor or multi-sensory handwriting interventions seemed ineffective. It is not known how much teacher awareness there is of this variation in effectiveness.

Santangelo and Graham (2016) also identified that handwriting fluency interventions were more beneficial for Grade 5-9 (10-16 years) than Kindergarten – Grade 4 (5-10 years). A possible explanation is the necessity for acquisition of accurate letter formation skills before fluency instruction becomes effective, reflecting motor-control development constraints, for example the comparatively late maturation of distal motor control, as described in chapter 1. In addition, participants gained more from legibility interventions which were of longer duration.

Santangelo and Graham (2016) considered that some interventions – those with effect sizes of practical importance but which were nonsignificant –

particularly merited further investigation. For legibility these comprised self-evaluation, writing individual letters with motion models, and individual letters copied or written from memory. In terms of fluency they were self-evaluation and individualised instruction.

2.1.2 Spelling

Comparatively little is known about spelling interventions, indicating a need for further investigations in this area. Graham and Santangelo (2014) compared the effectiveness of explicit spelling instruction vs. informal instruction as needed in the classroom context, unrelated instruction (e.g. reading) or lack of instruction. In addition they investigated whether there were improvements in spelling accuracy in the context of classroom writing activities following instruction. In each case, explicit instruction was the most effective in promoting accuracy, including spelling in context. Despite this, at least for grades 1-6 (6-12 years) the effect of explicit instruction in spelling on quality and length of writing in context was non-significant, an unexpected finding.

As shown above, explicit instruction appeared successful for both handwriting and spelling. However, while tuition in handwriting legibility and fluency generalised to compositional quality, this did not appear to be the case for spelling. A potential explanation is that while spelling knowledge is acquired during primary school, the cognitive demands posed by using this knowledge in context are still sufficient to prevent appreciable transfer of working memory resources from spelling to higher-level processing.

2.1.3 Composition

Similar to handwriting and spelling, Graham and Harris (2017) focussed on the effectiveness of explicit instruction in composition tuition. In addition, they examined methods of supporting students' writing, for example the process approach to writing (extended writing for real audiences with planning, drafting, revising, editing, self-reflection, evaluation and immediate feedback), word processing, peer collaboration, setting writing

goals, and pre-writing activities (e.g. research and graphic organizers). Teacher, peer- and self-feedback were also investigated, as well as increasing frequency of writing tasks, writing to comprehend and writing to learn (e.g. note-taking and text comprehension).

The strongest positive effect in compositional writing quality was associated with explicit teaching of planning, review and editing. There were also larger effect sizes for explicit instruction of both text generation (vocabulary and sentence combining) and transcription. In addition, the writing composition meta-analysis findings also demonstrated the benefits of evaluation (teacher-, peer- or self-). This was particularly the case for teacher-assessment, which enables not only feedback to children individually but also planning of future instruction on both a class- or child-basis. There were also benefits from teacher-specified writing goals; peer collaboration in planning, revising and editing; pre-writing activities and research; word processing and increasing writing frequency. Writing about text or lesson content (e.g. note-taking) promoted comprehension.

Grammar instruction did not appear to be effective. However, Myhill, Jones, Lines, and Watson (2012) commented that research has focused on decontextualized, rules-based instruction (typical of the studies contributing to Graham and Harris) rather than contextual instruction (i.e. focusing on meaning-making in specific contexts). They found, for example, that the contextualized instruction schemes drawn up by the researchers promoted compositional quality of Year 8 writing more than teacher-designed rules-based schemes.

It was noted that interventions by mid-career teachers (5-10 years' experience) were the most successful. This was ascribed to the relative inflexibility of recently qualified teachers and more experienced teachers' beliefs impacting on willingness to adopt intervention materials (Jones, Myhill, & Bailey, 2013).

Table 1 summarises the meta-analysis findings. The interventions are ordered by effect size. Effect sizes in cells shaded grey are significant; those which are nonsignificant are in white cells.

As shown in the table, most of the interventions for composition were significant and had effect sizes of practical importance. In contrast, half of those for handwriting did not have significant effects, suggesting that teaching effectiveness may be less than optimal unless classroom interventions are well-chosen. There were been fewer interventions related to spelling. Most were significant and with effect sizes of practical importance.

Table 1 Findings from systematic reviews and meta-analyses on tuition in handwriting, spelling and writing

Handwriting meta-analysis Santangelo and Graham (2016) (80 studies)			Spelling meta-analysis Graham and Santangelo (2014) (53 studies)			Composition meta-analysis Graham and Harris (2017) (20 meta-analyses)		
Intervention vs. most frequent control (Grade band)	Skill	Effect size	Intervention vs. most frequent control (Grade band)	Skill	Effect size	Intervention vs. Control (Grade band)	Skill	Effect size
Explicit instruction vs. unrelated (1-9)	Word count	1.33	Explicit instruction vs. informal instruction (1-6)	Spelling accuracy in context	0.94	Explicit instruction of leaning/ revising/ editing (2-10)	Writing quality	1.26
Using technology in instruction vs. no intervention (K-6)	Legibility	0.85	Increased amount of explicit instruction (1-10)	Spelling accuracy	0.70	Teacher assessment (2-9)	Writing quality	0.87
Explicit instruction vs. unrelated (1-9)	Composition quality	0.84	Explicit instruction vs. unrelated (K-10)	Spelling accuracy	0.54	Specific teacher writing goals (4-8)	Writing quality	0.80
Explicit individualized instruction vs. non-individualized (1-7)	Legibility	0.69	Explicit instruction vs. reading or PA ¹ (K-12)	Reading	0.44	Explicit instruction of vocabulary (3-8)	Writing quality	0.78
Explicit instruction vs. no instruction (K-9)	Hand-writing fluency	0.63	Explicit instruction vs. reading, writing or PA (K-12)	Spelling accuracy	0.43	Peer assessment (2-9)	Writing quality	0.77
Explicit instruction vs. no instruction (K-9)	Legibility	0.59	Explicit instruction vs. informal (1-6)	Writing quality and length	NS ² (0.19)	Peer collaboration, planning/ revising/ editing (2-12)	Writing quality	0.74
Explicit instruction vs. unrelated (1-9)	Writing: words per minute	0.48	(No further variables)			Explicit instruction of spelling/ handwriting (1-3)	Writing quality	0.56/ 0.53

Handwriting meta-analysis Santangelo and Graham (2016) (80 studies)			Composition meta-analysis Graham and Harris (2017) (20 meta-analyses)		
Intervention (Grade band)	Skill	Effect size	Intervention (Grade band)	Skill	Effect size
Self-evaluating handwriting vs. variable controls (1-8)	Fluency	NS (0.66)	Self-assessment (2-9)	Writing quality	0.51
Explicit individual instruction vs. non-individualized (1-7)	Fluency	NS (0.58)	Explicit instruction of sentence combining (4-9)	Writing quality	0.50
Writing individual letters with motion models vs. static models (K-3)	Legibility	NS (0.26)	Writing about text (2-12)	Comprehension	0.50
Individual letters copied or written from memory vs. no instruction (K-3)	Legibility	NS (0.26)	Pre-writing activities (2-9)	Writing quality	0.48
Motor vs. handwriting instruction (K-4)	Legibility	NS (0.18)	Word processing (1-12)	Writing quality	0.44
	Fluency	NS (-.06)	Collecting/ analysing data) (3-12)	Writing quality	0.37
Motor instruction vs. no instruction or non-motor instruction (K-8)	Legibility	NS (0.10)	Process approach to writing (1-12)	Writing quality	0.34
	Fluency	NS (-.07)	Explicit tuition in text structure (2-10)	Writing quality	0.30
Multisensory instruction vs. non multisensory (K-4)	Legibility	NS (0.02)	Explicit instruction in emulating quality writing (3-12)	Writing quality	0.30
			Writing about lesson content (2-12)	Learning content	0.29
			Increasing writing requeryency (2-8)	Writing quality	0.24
			Explicit teaching of grammar (3-11)	Writing quality	NS (-0.17)

¹PA: phonological awareness

²NS: non-significant

2.2 Other interventions

Meta-analysis has enabled calculation of the effect sizes deriving from a range of interventions in handwriting, spelling and compositional writing. However, various interventions have not yet been included in meta-analyses owing to insufficient studies. A selection are described here, but further research is necessary before implications can be drawn from them.

Berninger et al. (1997), D. Hayes (1982) and Vinter and Chartrel (2010) compared the effectiveness of cues used in handwriting instructions (e.g. demonstrations with teacher instructions, directional arrows). Access to multiple cues appeared beneficial and copying the least effective.

Overvelde, and Hulstijn (2011) explored additional types of training for children aged 8: tracing, pursuit of a moving target, and explicit (written) instructions. Although the most accurate trajectories were produced during training using tracing, it resulted in the least learning. This may have resulted from reliance on working memory-demanding feedback motor-control, leaving little spare capacity for learning.

Alvez et al.(2016) compared writing performance in children aged 7-8 years after training in handwriting, spelling, or keyboarding. Handwriting instruction incorporated orthographic training (e.g. copying letters in words and sentences, generating words in phonemic or semantic categories, and counting number of words in compositions). The handwriting group subsequently demonstrated the greatest handwriting fluency and compositional quality. Writing performance also improved following orthographic training for 10-11-year-olds in Limpo, Parente, and Alves (2018) and 6-7-year-olds in Graham, Harris, and Fink (2000).

Limpo, Alves, and Fidalgo (2014) compared executive functioning between 9-12 and 12-15 years of age. While they found a progressive development in planning and revision skills between 9 and 15 years, planning and revision did not impact on compositional quality of writing until after transfer to secondary school. However, Limpo et al. suggested that while

lack of evidence of planning and revision amongst younger pupils may be a consequence of immaturity of executive functioning, there may also be a lack of appropriate instruction. Indeed Harris, Graham, and Mason (2006) found that even 7-year old children could learn planning skills if there had been targeted interventions. Revision may be local or global (i.e. associated with meaning). Graham (1997) determined that local revision did not increase compositional quality whereas global revisions did (De La Paz, Swanson, & Graham, 1998), and Limpo et al. found that participants were more able to correct errors than identify them.

2.3 Teacher surveys on instruction of writing in school

The effectiveness of educational interventions can be estimated from intervention studies. However, generalization to classroom practice may be questionable owing to greater environmental variation. In addition, communication between researchers and the education community may be sub-optimal (Graham et al., 2016). An alternative source of information is practitioner surveys, reflecting actual classroom practice.

Evidence from 12 teacher surveys on writing skills tuition is considered in this section. The surveys fall into three categories: handwriting (Barnett, Henderson, & Stainthorp, 2006; Graham, Harris, et al., 2008); spelling (Fresch, 2003, 2007; Graham, Morphy, et al., 2008; Johnston, 2001; McNeill & Kirk, 2014); and writing, including both lower- and higher-level processing (Brindle et al., 2016; Cutler & Graham, 2008; Dockrell et al., 2016; Gilbert & Graham, 2010a; Graham, Harris, Fink-Chorzempa, & MacArthur, 2003). Only two were carried out in the UK (shaded grey): Barnett et al. and Dockrell et al. (see Table 2)

This section is in three sections. The first is teachers' perceptions of the adequacy of their training in writing tuition. Secondly, classroom practice in handwriting, spelling and writing tuition is reviewed. The final section examines the extent to which research-based teaching recommendations are utilized in the classroom.

Table 2 Scopes of surveys of teaching of handwriting, spelling and writing (ticks indicate comment in survey report)

Tuition	Hand-writing		Spelling					Writing				
Study characteristics and content	Barnett et al. (2006)	Graham, Harris, et al., (2008)	Fresch (2003)	Fresch (2007)	Graham, Morphy, et al. (2008)	Johnston (2001)	McNeill and Kirk (2014)	Graham et al. (2003)	Cutler and Graham (2008)	Brindle et al. (2016)	Dockrell et al. (2016)	Gilbert and Graham (2010a)
Age range	4-11	6-9	6-11	6-11	6-11	7-11	7-12	6-9	6-9	8-10	4-11	9-12
Number of schools/ teachers	39/39	169	355	355	168	42	405	153	178	157	88	103
Country	UK	US	US	US	US	US	NZ	US	US	US	UK	US
School handwriting/ spelling/writing policies	✓	✓	-	-	-	✓	✓	-	-	-	-	-
Teacher perception of adequacy of preparation for tuition	✓	✓	✓	✓	-	-	✓	-	✓	✓	✓	✓
Frequency and/or duration of dedicated tuition sessions	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓
Length of time spent writing cross-curriculum	-	-	-	-	-	-	-	✓	✓	✓	-	✓
Instructional practices	✓	✓	✓	✓	✓	✓	✓	-	-	✓	✓	-
Promotion of handwriting speed	✓	✓	-	-	-	-	-	-	-	-	-	-
Accommodation for children with difficulties	✓	✓	-	-	✓	✓	✓	✓	-	-	✓	✓
Monitoring and evaluation	✓	✓	✓	-	✓	✓	✓	-	✓	✓	-	-

2.3.1 Teacher training

Teacher training occurs in various contexts. These include initial training, in-service training (INSET) and private study. Teacher training serves a number of functions, including transmission of knowledge of research-based teaching recommendations and promotion of self-efficacy. Accessing INSET and private study is affected by the time-pressures experienced by teachers and perception of need.

2.3.1.1 Handwriting

In their UK survey, Barnett et al. (2006) found that only a third of teachers had received initial training in handwriting tuition and more than half felt that their colleagues were insufficiently well trained. However, almost all of the surveyed teachers in Graham, Morphy et al. (2008) (US) had received in-service training (INSET) within the last 5 years.

2.3.1.2 Spelling

The UK Office for Standards in Education (Ofsted; 2012a) reviewed initial training in synthetic phonics and commented that 58% of newly qualified UK teachers felt well prepared for teaching spelling. INSET training is available for teachers whose initial training preceded the current emphasis on synthetic phonics. In contrast, McNeill and Kirk's (2014) finding that only 31% of teachers felt adequately prepared (New Zealand).

2.3.1.3 Compositional writing

Dockrell et al. (2016) (UK) identified that 59% of their participants considered that their training in teaching of compositional writing was at least very good, with the remaining feeling that it was adequate. In addition, most had experienced relevant INSET. Brindle et al. (2016) and Gilbert and Graham (2010a) indicated that while more than two-thirds of their participants had received little initial training, four-fifths considered that they had achieved at least adequate knowledge through INSET or individual initiatives. Despite these indications of teacher perceptions of adequate preparedness, widespread concern is expressed about writing

standards in both UK and US, and the authors of several of the surveys considered here suggested that further training would be beneficial.

2.3.2 Classroom practice in handwriting, spelling and writing tuition

Due to widespread concern about the quality of students' writing there have been a substantial number of studies related to effective learning and practice conditions – external factors – intended to promote writing skill acquisition. However, as shown in the discussion of meta-analysis findings, these have focused mainly on text generation outcomes. Apart from demonstrations that explicit instruction in handwriting and spelling is more beneficial than lack of tuition, little else is known about other aspects of effective learning and practice conditions for transcription skills.

There is a considerable body of research relating to acquisition of sporting skills. In the absence of handwriting-specific studies, some findings from the much more extensive research into learning and practice conditions for motor learning have been generalized to handwriting. It remains to be demonstrated whether all such generalizations are appropriate.

This section examines the frequency and duration of tuition in handwriting, spelling and composition. These external factors are manipulable within timetabling and classroom practice.

2.3.2.1 Handwriting tuition

Barnett et al. (2006) found that over 90% of teachers gave dedicated handwriting tuition as recommended in Santangelo and Graham's (2016) meta-analysis findings. Nonetheless, some children receive little or no tuition, especially in the final years of primary education.

Graham and Miller (1980) recommended that there should be 50-100 minutes of handwriting tuition per week in primary school (although Graham, Bollinger, et al., 2012, noted the lack of empirical evidence for this statement). While Graham, Harris, et al. (2008) found that mean duration of handwriting sessions per week was 70 minutes, the other surveys reviewed

in this chapter suggested that Graham and Miller's recommendation were not being met.

C. H. Shea, Lai, Black, and Park (2000) investigated practice spacing for motor-skill acquisition. They found that participants benefited more from sessions separated by 24 hours rather than 20 minutes. This may be a product of time required for consolidation of memories. Graham and Hebert (2011) and Graham and Miller (1980) both recommended that handwriting tuition at school should occur in sessions which were short and daily, although there has been no handwriting-specific empirical justification or definition of the term 'short'. Approximately half of teachers taught children aged 6-9 years handwriting at least twice per week, many daily. Barnett et al. (2006) found that tuition frequency was linked with the duration of each session; they found that daily sessions lasted for up to 15 minutes, twice weekly sessions up to 30 minutes, and weekly sessions between 15 and 30 minutes. Graham, Harris, et al.'s (2008) findings were similar.

Practice session design varies. It may be blocked (repetition of the same action), interleaved (small sets of related actions are executed, but the actions are sequenced randomly within each set), or random (a group of related actions are carried out in random order). Although accuracy of performance during training trials tends to be superior if practice is blocked, the opposite is true for subsequent retention (same task) and transfer (related task) tests (Albaret & Thon, 1998). This has been attributed to beneficial effects of contextual interference, derived from practising sets of two or more different tasks over the same period, resulting in the necessity for greater depth of processing (Schmidt & Lee, 2011).

Ste-Marie, Clark, Findlay, and Latimer (2004) compared blocked and random practice during handwriting-skill acquisition with participants ranging in age from 5-7 years. The findings for accuracy were inconclusive, whether for training, retention or transfer tests. However, when writing

speed was introduced as an additional factor; children in the random group wrote significantly faster in both the retention and transfer tests.

Saemi, Porter, Ghotbi-Varzaneh, Zarghami, and Shafinia (2012) compared blocked or random practice with a schedule of increasing interference in a tracking task using a lit wand. They found that learning was greatest when interference progressively increased. Rohrer, Dedrick, and Burgess (2014) found that the positive effect of interleaving was greatest when it was necessary to distinguish between similar entities, potentially relevant to confusable letters (e.g. d/b) though there is no handwriting-specific evidence.

2.3.2.2 Spelling tuition

Fresch (2003) found that most teachers incorporated spelling lessons with 73% of the participants believing that dedicated spelling lessons were necessary, consistent with Graham and Santangelo's (2014) recommendations. Almost all children in Cutler and Graham (2008) and Graham et al. (2003) (in each case 6-9 years) received tuition at least once each week, and half had daily sessions. Frequency was lower for the 9-12 year old children in Gilbert and Graham (2010a) but, nonetheless, 80% of children had tuition on a weekly basis or more frequently. Dockrell et al. (2016) (children aged 4-11 years) reported that most teachers gave spelling instruction at least weekly but an overall spectrum of session frequency was not provided.

Fitzsimmons and Loomer (1978) suggested that children should have 60-75 minutes of spelling tuition per week, a range still widely cited but not empirically justified. Graham, Morphy, et al. (2008) found that the mean amount of tuition per week was just under 90 minutes and the equivalent figure for Cutler and Graham (2008) was 72 minutes, suggesting that teachers in at least those surveys were respecting this recommendation.

2.3.2.3 **Composition - text generation and executive functions**

Writing skills incorporate both text generation and executive functions, as well as transcription. This is illustrated in Dockrell et al. (2016) in which frequency of tuition in various areas of writing knowledge in English primary schools is compared. They found that work on vocabulary and the grammatical functions of words occurred more than once per week (significantly more frequently than other domains); punctuation, sentence-level (grammar) and text-level work (e.g. paragraph construction and text forms) occurred approximately once per week; and planning, review and revising approximately monthly (significantly less than all other domains). Duration of sessions was not included.

As indicated in Graham and Harris (2017), there was a substantial effect size on compositional quality deriving explicit instruction in handwriting at least till the end of primary school. This is consistent with models of motor-learning in which there is progressive increase in automaticity and consequent release of working memory resources for higher-level processing. However, the effect size for explicit instruction in executive functions was larger, as were those for peer collaboration in planning/reviewing/and editing, teacher and peer assessment, and instruction in vocabulary. The US primary school surveys carried out by Graham et al. (2003) and Cutler and Graham (2008) both suggested that instruction duration in higher-level processes in writing (approximately 1.5 hours per week) was less than for lower-level processing – including handwriting, spelling, grammar, punctuation and capitalization (approximately 3.75 hours per week). Although moderator analyses were carried out for some variables in the meta-analyses, very little is known about the interrelationships between the factors.

Effect sizes may be modified by other external factors. For example, there is continuous time-pressure in education. The amount of curriculum guidance varies between subjects or countries; for instance, the NC for writing in the UK provides greater guidance than is given in the US, and the

UK primary NC for handwriting is more abbreviated than that provided for spelling. In addition, most writing-related research has occurred in the US. Factors such as these are problematic in terms of interpreting findings.

2.3.2.4 Cross-curriculum writing practice

Apart from dedicated tuition in handwriting, spelling and higher-level processing, children practice their writing skills across the curriculum. This contributes not only to recording, organizing and learning curriculum content, but also practising both lower and higher-level writing skills in context.

McHale and Cermak (1992b) estimated that primary school children in Grades 2-6 (7-12 years) spend approximately half of their time in class occupied in handwriting tuition and cross-curriculum handwriting-based tasks. This amounted to 100 minutes per day. McHale and Cermak's study is still widely cited although was published 25 years ago and the figure may have changed substantially since that time due to changes in the curriculum and teaching methodology. Furthermore, it pre-dates the introduction of keyboarding in classrooms and the study was conducted in the USA.

Brindle et al. (2016) and Gilbert and Graham (2010a) found that children's total writing time per week was approximately 3.5 hours. However, the amount of paragraph-or-multiparagraph writing occurring may be considerably more limited, for example Cutler and Graham (2008) (Grades 1-3, 6-12 years) estimated 20 minutes per day, and Gilbert and Graham (Grades 4-6, 9-12 years) 25 minutes. There is no equivalent data for UK primary schools and the US findings may not be representative.

Amount of writing carried out has been estimated using time duration. However, measuring writing in terms of time elapsed is an inexact estimate of practice due to considerable variation in children's rate of output. Amount committed to paper would provide a more valid estimation, particularly in terms of transcription.

2.3.3 Use of evidence-based teaching recommendations

The meta-analyses discussed in this chapter compared the effectiveness of a series of teaching interventions in handwriting, spelling and compositional writing tuition. This section examines the extent to which teachers in the surveys described here used evidence-based teaching.

2.3.3.1 Handwriting

Barnett et al. (2006) and Graham, Harris, et al.'s (2008) survey findings were compared with Santangelo and Graham's (Santangelo & Graham, 2016) meta-analysis and other studies. Certain research-based recommendations were widely utilized. For example, almost all teachers in both Barnett et al. and Graham, Harris, et al. provided explicit handwriting instruction, as recommended in Santangelo and Graham. In contrast, only 10% of teachers incorporated timed handwritten tasks into their tuition, despite demonstration of its positive effects (Alves et al., 2016) and consistency with models of motor learning. It should be noted that further research on the effects of speed promotion is necessary since comparatively little research has been carried out in this area. Some activities were widely used despite their lack of significant effect or for which evidence is equivocal or limited, for example verbalisation of letter-formation stages during letter writing, copying and tracing.

2.3.3.2 Spelling

Graham and Santangelo's (Graham & Santangelo, 2014) meta-analysis focused principally on the positive effects of explicit spelling instruction on spelling accuracy (including in the context of written work). The great majority of participants in the spelling surveys timetabled explicit instruction of spelling, as recommended in the meta-analysis. There were, however, substantial differences between teacher practice and beliefs, as identified by Fresch (2003, 2007) and McNeill and Kirk (2014). For example almost all considered that there should be instruction in phonics, phonological awareness or orthographic strategies at least weekly (reflecting

multiple-resource theories of spelling), whereas only approximately a third enacted it.

Several studies have concurred that learning spellings through cover, copy and compare (CCC) is more effective than multiple copying (Joseph et al., 2012; McGuffin, Martz, & Heron, 1997; McNeill & Kirk, 2014; Schlagal, 2002).

Despite this, half of the teachers in Fresch (2003, 2007) and McNeill and Kirk (2014) encouraged multiple copying and there was no evidence of CCC. There was also little evidence reported of other practices for which there is some evidence of effectiveness, for example self/correction self-correction (McGuffin et al., 1997; Puliatte & Ehri, 2018) or pre-testing (Schlagal, 2002, 2013). A range of further spelling interventions was reported. These including textbook/worksheet exercises, spelling games, word sorting, writing words in sentences, and dictionary work. The effectiveness of these activities has not yet been investigated.

Two thirds of the participants in Fresch (2003, 2007) considered that there should be grade-specific words. The majority in Fresch, and McNeill and Kirk (2014) also believed that it was beneficial to group children by ability and utilize spelling lists based on spelling developmental-level (as recommended by Morris, Nelson, & Perney, 1986; Putman, 2017; Schlagal, 2013). Despite this, only some participants incorporated these practices. Reasons for teachers not actioning their beliefs included lack of time, contrary school or educational district directives, and lack of resources.

In general, teachers were concerned that spelling accuracy in weekly tests did not generalize to written work (contrary to the findings of Graham & Santangelo, 2014). In addition, many teachers felt unable to meet the individual needs of children who were experiencing spelling difficulties. The authors of all four surveys of spelling tuition commented that INSET should be emphasized as research findings have not always resulted in changes in schools. Applying the findings of the spelling surveys to UK

classrooms may be inappropriate since they were carried out in the US or New Zealand.

2.3.3.3 **Composition**

As was shown in table 1, there is much more evidence available for composition tuition than for other writing sub-skills. It shows that many of the activities shown to be effective in Santangelo and Graham's (2016) meta-analysis were also used by participants in the compositional writing surveys (one of which was UK-based – Dockrell et al, 2016). For example, well over half of teachers reported teaching planning at least once per week and roughly one in two covered reviewing on a weekly basis. Working with peers also seemed frequent and self-evaluation occurred at least weekly in approximately half of the classes. Pre-writing activities and modelling were common, and lessons in text organization and sentence combining took place approximately once per week in half of the classes. In addition, written response to classroom content occurred at least weekly in more than half of classes (i.e. learning through writing). Only Dockrell et al. included the extent of explicit teaching of vocabulary and peer-evaluation and, on average, these occurred at least weekly. Similarly increasing writing frequency was included solely in Graham et al. (2003).

Grammar instruction occurred in almost all classes at least once per week. Graham and Harris's (2017) findings suggested that its effect on compositional quality was nonsignificant. This contrasted with the findings of Myhill et al. (2012). However, most of the grammar instruction in Graham and Harris participating studies was decontextualized, i.e. rule-based, whereas the effect identified by Myhill et al. was a product of contextualised instruction.

Instruction in punctuation and capitalization was reported in three surveys. This occurred at least weekly in the majority of classes (Graham et al., 2003, 70%; Cutler & Graham, 2008, 92%; Dockrell et al., 2016, 100%). The considerable emphasis in Dockrell et al. may well be a product of requirements in the NC for English in UK.

Many teachers felt capable to provide suitable adaptations for children experiencing writing difficulties. However, Graham et al. (2003) noted that 75% of the adaptations were made by less than a third of their participants and 20% made no adaptations. This precipitated a comment that additional training may be beneficial.

2.4 Key points and conclusions

This chapter reviewed the findings of three meta-analyses of writing instruction. Subsequently the findings of 12 surveys completed by writing teachers were compared.

The meta-analyses of handwriting and composition covered a wide range of interventions. Overall, the most significant conclusions were the effectiveness of explicit instruction and the extent to which explicit instruction in writing subskills generalised to compositional quality. It was also noticeable that only half of the interventions included in the handwriting meta-analysis resulted in significant and practically important results. It is important that there is sufficient initial training or INSET to enable informed choice of handwriting interventions in order to maximise teaching effectiveness.

The results of interventions which have not yet been included in handwriting meta-analyses suggested children benefited from access to multiple cues whereas tracing and copying appeared less effective. Orthographic training in handwriting boosted not only productivity but also compositional quality. Limpo et al.'s (2014) findings suggested that planning and revisions skills continued to develop well into secondary school. These results require corroboration before policy implications can be considered.

Out of the 12 teacher surveys, only two occurred in the UK (handwriting – Barnett et al., 2006; handwriting, spelling and composition – Dockrell et al.,

2016). This summary focusses on their findings since aspects of the others may not be representative of UK classroom practice and further UK-based research is needed.

Barnett et al. (2006) found that the majority of teachers considered that training in handwriting in tuition was insufficient. In contrast, Ofsted (2012a) concluded that more than half of NQ teachers felt prepared for spelling tuition. All participants in Dockrell et al. (2016) commented that their training in compositional writing was at least adequate.

The great majority of teachers reported giving dedicated tuition in handwriting, spelling and composition, although duration and practice conditions varied considerably. While there are recommendations for amount of time which should be allotted to handwriting, spelling and composition instruction, there is a lack of empirical evidence to support them. The UK statutory NCs for spelling and composition are detailed and probably have a significant effect on timetabling. There is very little evidence indicating the amount of handwritten work occurring across the curriculum (reflecting the amount of practice with handwriting) as opposed to in dedicated lessons.

Some research-based recommendations were widely used in the classroom, for example explicit teaching of handwriting, spelling and composition. However, particularly for handwriting and spelling, others were rarely used (e.g. promotion of handwriting speed and CCC as a tool for learning word spellings). Furthermore, there was widespread use of activities whose effectiveness has not yet been investigated. Particularly in spelling, teacher beliefs were not necessarily reflected in their practice, attributed to factors such as lack of time. Unlike handwriting and spelling, classroom practice in teaching compositional skills often reflected research-based recommendations.

As shown in this chapter, intervention studies have demonstrated that learning conditions impact on knowledge acquisition and, while there is

evidence of good classroom practice teaching effectiveness could nonetheless be improved. Many of the survey authors concluded that additional teacher training would be beneficial.

Chapter 3 examines another type of external factor impacting on writing performance: curricula and assessments.

3 CURRICULA AND ASSESSMENTS

As discussed in chapters 1 and 2, efficiency of learning is influenced by both internal and external factors. Chapter 3 now reviews Key Stage 2 writing curricula and assessments. Curricula constitute an additional form of external factor and assessments are intended to gauge efficiency of learning.

The UK NC provides details of statutory educational provision. The purpose of the NC is to enable children to reach expected levels of attainment while being sufficiently flexible to take into account individual differences. While schools are required to follow the NC, they remain in control of many elements, for instance pedagogical methodology, providing this enables them to teach the statutory elements (Rose, 2009). NCs are drafted using theoretical knowledge and evidence from intervention, as discussed in chapters 1 and 2.

The aim of this chapter is to investigate the extent and detail of guidance provided to teachers in the UK for writing tuition by the NC. Subsequently there is a description of assessment associated with the NC.

3.1 The UK NC for writing

Data collection for this project immediately preceded a time of transition from a NC dating from 1998/1999 to one introduced in 2013/2014, and a move from centrally assessed compositional writing to teacher-assessment. The content of the 1998-2013 NC is summarized below. The framework document for the new NC was circulated during the period during which data for this project was collected (DfE, 2013a). The basic structure is similar but with some changes in emphasis. These are noted in what follows.

3.1.1 Handwriting

The Primary National Literacy Strategy (1997-2013) (DfES, 2006) provided detailed information for teaching handwriting in Key Stage 1 (5-7 years, Years 1 and 2). In contrast, the NC for Key Stage 2 (7-11 years, Years 3-6) was brief and contained guidance. The Key Stage 2 requirements were that pupils should be taught to:

- Write legibly in both joined and printed styles with increasing fluency ... [i.e. degree of accurate joining between letters] ... and speed
- Use different forms of handwriting for different purposes (for example, print for labelling maps or diagrams, a clear, neat hand for finished presented work, a faster script for notes)

(DfEE & QCA, 1999)

Schools were required to provide children with handwriting lessons until the end of Year 3. There was an expectation that handwriting practice would take place in Year 4, although not lessons. Neither lessons nor practice were required in Year 5 or 6. There were few changes when the new NC was introduced although practice was intended to extend into upper Key Stage 2 (Years 5 and 6) in order to promote handwriting speed. However, no guidance was provided about teaching strategies to achieve this end. Furthermore, no recommendations were given in either NC about the amount of cross-curriculum practice which should occur.

In this context, school handwriting policies are potentially important sources information for teachers owing to the lack of detail provided in the NC for Key Stage 2 handwriting. School policies include details such as example alphabets, the school year in which joining will be introduced and whether personalisation is permitted (see Barnett et al., 2006; National Handwriting Association (NHA), Tibertius, n.d.); National Literacy Strategy, DfEE. 2001). It is also recommended that handwriting policies should be documented, policy development should be led by a staff member but with all staff contributing to discussion, and all teachers and teaching assistants

should adhere to the policy, including use of the specified school handwriting style throughout the school. There is, however, little information available about schools' handwriting policies and the extent to which they are adhered to by teachers, apart from the survey conducted by Barnett et al. (2006).

3.1.2 Spelling

The UK national curriculum (NC) for spelling required that spelling knowledge should be taught through synthetic phonics, particularly in Key Stage 1 (4-7 years). Synthetic phonics tuition reflects the non-lexical processing route in dual-route spelling models in that words are segmented into phonemes each then spelled according to learned phoneme/grapheme correspondence rules. Spelling tuition in UK Key Stage 2 (7-11 years) incorporated aspects of both triple word form theory (Berninger et al., 2009) and the integration of multiple patterns framework (Treiman & Kessler, 2014) and detailed guidance is provided in the NC. For example, pupils were expected learn to use not only phoneme/grapheme correspondences learned through synthetic phonics, but also spelling strategies such as use of morphological and etymological knowledge. Children also learned terminology such as consonant, homophone and syllable. They were encouraged to use strategies to check spellings including word banks, dictionaries and spellcheckers, although there is a lack of evidence demonstrating the effectiveness of these activities. The new NC spelling curriculum is similar but provides greater detail. Owing to the considerable detail provided in the primary school NC for spelling, it could be argued that there is less necessity for specifying curriculum content in school policies for spelling than in those for handwriting.

It is assumed that by the end of Key Stage 2 tuition will have provided sufficient strategies to enable students to spell any word, suggesting that students are at least tending towards automaticity. Consistent with this, whole-class instruction is not required after transfer to secondary education.

The meta-analysis findings outlined in chapter 2 emphasized the positive effects of explicit instruction in spelling. The previous and current NCs for spelling appear to rely more on explicit teaching rather than memorization, thus promoting deep learning. They would, however, appear likely to impose significant cognitive demands on children owing to the necessity for parallel processing of several types of information, with potential negative impact on compositional quality. In addition, comparatively little is known about optimal learning conditions, including practice in context (a feature of the integration of multiple patterns framework, Treiman & Kessler, 2014). Further work on the association between use of spelling strategies and compositional quality is required.

3.1.3 Composition

Like the NC for spelling, the Key Stage 2 NC for writing at the time of data collection provided detailed content on tuition. It reflected many features of the not-so-simple view of writing (Berninger & Winn, 2006). There were also elements of knowledge telling and the more complex processing required for knowledge transforming (Bereiter & Scardamalia, 1987).

Instruction in text-generation ranged from word- to discourse-levels. Word-level learning included augmentation of vocabulary knowledge and learning the grammatical functions of words (nouns, verbs, adjectives, adverbs, pronouns, prepositions, conjunctions and articles). Sentence-level work incorporated work on clauses, phrases and connectives, and variation in sentence structure. In addition, children were expected to understand the purpose of paragraphing, and taught to use sequencing and structure in their discourse-level writing. Tuition in executive functioning was directed towards planning, revision and proof-reading. In addition, children were expected to have knowledge of several writing genres, for example description, narration, and persuasion, and write for a variety of audiences.

Further requirements were that students should be taught to use full stops, question and exclamation marks, commas, inverted commas, and apostrophes (punctuation being omitted from both the not-so-simple view of

writing, and knowledge telling/transforming). Children were also instructed in use of layout and presentation. In addition they were taught techniques for self- and peer-evaluation.

The new NC specifies punctuation requirements in more detail and children are expected to acquire grammatical knowledge of greater complexity. There is less focus on genre-writing and more on text structure and sentence construction, suggesting a greater emphasis on the details of writing skills rather than discourse knowledge.

3.2 Assessment

This section summarises school-based assessment in the context of the NC. It examines whether the assessment procedures reflect firstly NC content and secondly models of handwriting, spelling and text generation.

Statutory testing in core subjects occurs at the end of Key Stage 2 (the end of Year 6). The expected level of attainment is Level 4. The time when data was collected for this project was a period of transition between externally marked SATs in compositional writing and teacher-assessment. The SATs writing test incorporated two composition passages for which a maximum of 40 marks was available for composition. In addition, there were three marks for handwriting and seven for spelling. This system has been replaced by purely teacher-assessment for compositional writing (using a portfolio of writing including sufficient different forms of genre-writing to enable an all-round judgement of writing capability). In addition, there is a SAT encompassing spelling, punctuation and grammar. Optional SATs tests are available for younger Key Stage 2 children, the expected level of attainment for Year 5 children being level 3-4.

An option for testing throughout primary school over the data-collection period of this project was Assessing Pupils' Progress (APP) (Qualifications and Curriculum Authority, 2009). This was a national assessment scheme

which conformed closely with the NC and SATs. APP provided detailed guidance on different strands of achievement on writing attainment, principally higher-level processing but also including handwriting and spelling. It was envisaged that APP assessment would occur approximately three times per school year and would incorporate a set of contrasting writing tasks in order to provide an overall picture.

3.2.1 Handwriting

Marks for handwriting in Key Stage 2 SATs for writing are awarded for accuracy, consistency, and fluency (i.e. extent to which letters are joined). These reflect NC priorities. A maximum of only 3 marks can be awarded (out of 50 for writing as a whole), reflecting the lack of emphasis on handwriting in the Key Stage 2 NC for writing. For one mark, children's writing should be legible, though appearing disorganised and uneven. The two marks criteria include regularity and (in general) appropriate size and placement of letters and words. For 3 marks the handwriting should be consistent, fluent and with an engaging and personal style.

APP marking extended only to Level 3. Level 1 was awarded if letters are mostly correctly formed and oriented and there is spacing between words. Level 2 required clear letter formation with distinguishable ascenders and descenders and, in general, absence of upper and lower case letters confusion within words. For Level 3 letter formation should be accurate and consistent and the handwriting should sometimes be joined.

There is widely-accepted evidence that handwriting automaticity, typically measured using the alphabet writing task of orthographic-motor integration in which correctly ordered letters of the alphabet are written as rapidly as possible over a brief time period (Jones et al., 2013 and others), is a much stronger predictor of compositional quality than SATs handwriting score throughout primary school (e.g. Medwell, Strand, & Wray, 2008). However, automaticity is not measured in APP or SATs.

3.2.2 Spelling

Spelling accuracy is frequently classified on a simple binary basis, i.e. correct or incorrect. More complex error classification might include, for example, phonological plausibility. The marking in spelling assessment in SATs and APP differs. In SATs there is a binary judgement whereas APP records evidence of spelling strategies evident in composition, using the qualifier 'most' (e.g. 'correct spelling of most common grammatical function words, including adverbs with -ly formation'). This scoring method could be considered to reflect the NC for spelling and multiple resource models of spelling more closely than the binary marking in SATs.

3.2.3 Composition

Children's attainment in writing was judged principally using compositional tasks, either in APP, or end of Key Stage SATs, whether externally marked or teacher-assessed. This emphasis reflected the NC emphasis on genre-based writing and text structure. While the new NC focusses more on quality of writing and places greater prominence on grammar and punctuation, discourse-level composition nonetheless remains strongly highlighted.

Berninger and Winn (2006) divide text generation into word-, sentence- and discourse-levels. Children were assessed for vocabulary in SATs and APP tests of compositional writing, reflecting the NC for writing. Marks were awarded for selection of appropriate and effective words, for example the deliberate choice of vocabulary to create effects and use of specialist topic-related words. However, there is clearly greater emphasis on sentence-level (principally grammatical constructions) or discourse-level writing (e.g. paragraph and discourse-level text construction).

APP provided teachers with detailed tables providing specifications for each level of achievement in a series of assessment foci (AF) which corresponded with those in the NC for writing. Table 3 and figure 2 illustrate how AF can be integrated with the not-so-simple view of writing (Berninger & Winn, 2006).

Table 3 Assessment foci and the not-so-simple view of writing

Transcription	Text generation	Executive functions
Handwriting	Word-level	
Spelling	AF7: select appropriate and effective vocabulary	AF1: write imaginative, interesting and thoughtful texts;
AF8: use correct spelling	Sentence-level	AF2: produce texts which are appropriate to task, reader and purpose.
	AF5: vary sentences for clarity, purpose and effect;	
	AF6: write with technical accuracy of syntax and punctuation in phrases, clauses and sentences	
	Discourse-level	
	AF3: organise and present whole texts effectively, sequencing and structuring information, ideas and events;	
	AF4: construct paragraphs and use cohesion within and between paragraphs	

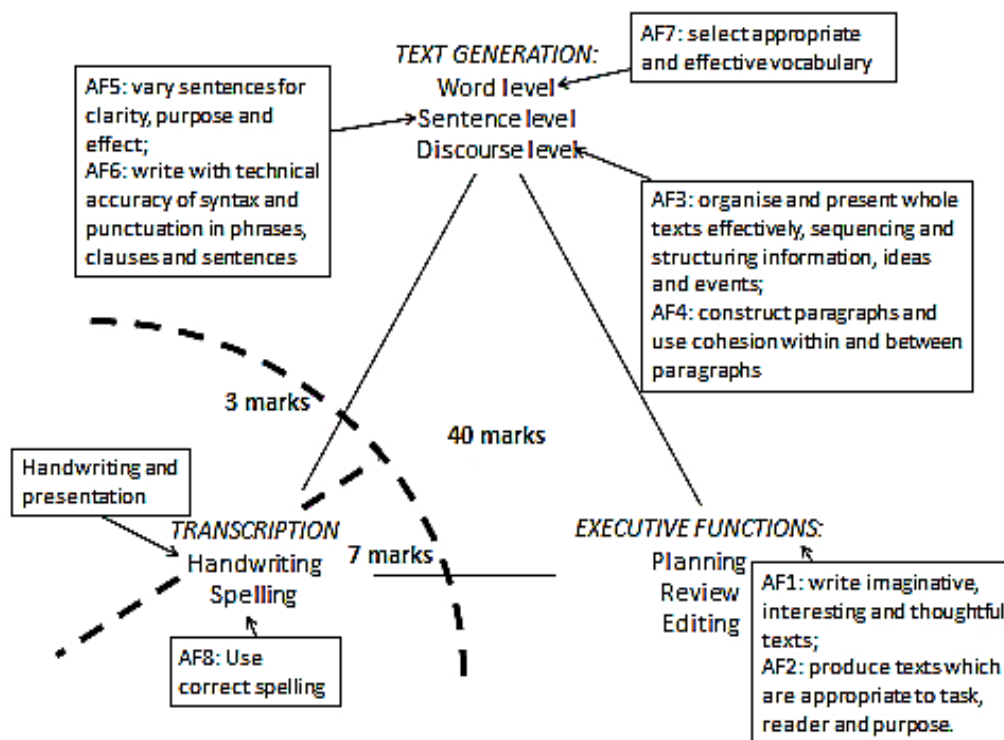


Figure 2 Assessment foci for writing and mark scheme superimposed on the not-so-simple view of writing. (Adapted from Berninger & Winn, 2006)

In APP assessment, children were classified by attainment level within each AF and an overall judgement was obtained by using a best-fit mechanism. Table 4 provides descriptors for Level 4 writing AF (expected attainment for Year 6).

Table 4 Level 4 assessment expectations

	Level 4 writing descriptors
AF1	<input type="checkbox"/> relevant ideas and content chosen <input type="checkbox"/> some ideas and material developed in detail, e.g. descriptions elaborated by adverbial and expanded noun phrases <input type="checkbox"/> straightforward viewpoint generally established and maintained, e.g. writing in role or maintaining a consistent stance
AF2	<input type="checkbox"/> main purpose of writing is clear but not always consistently maintained <input type="checkbox"/> main features of selected form are clear and appropriate to purpose <input type="checkbox"/> style generally appropriate to task, though awareness of reader not always sustained
AF3	<input type="checkbox"/> ideas organised by clustering related points or by time sequence <input type="checkbox"/> ideas are organised simply with a fitting opening and closing, sometimes linked <input type="checkbox"/> ideas or material generally in logical sequence but overall direction of writing not always clearly signalled
AF4	<input type="checkbox"/> paragraphs / sections help to organise content, e.g. main idea usually supported or elaborated by following sentences <input type="checkbox"/> within paragraphs / sections, limited range of connections between sentences, e.g. over-use of 'also' or pronouns <input type="checkbox"/> some attempts to establish simple links between paragraphs / sections not always maintained, e.g. firstly, next
AF5	<input type="checkbox"/> some variety in length, structure or subject of sentences

	<input type="checkbox"/> use of some subordinating connectives, e.g. if, when, because throughout the text
	<input type="checkbox"/> some variation, generally accurate, in tense and verb forms
AF6	<input type="checkbox"/> sentences demarcated accurately throughout the text, including question marks
	<input type="checkbox"/> speech marks to denote speech generally accurate, with some other speech punctuation
	<input type="checkbox"/> commas used in lists and occasionally to mark clauses, although not always accurately
AF7	<input type="checkbox"/> some evidence of deliberate vocabulary choices
	<input type="checkbox"/> some expansion of general vocabulary to match topic
AF8	correct spelling of
	<input type="checkbox"/> most common grammatical function words, including adverbs with -ly formation
	<input type="checkbox"/> regularly formed content/lexical words, including those with multiple morphemes
	<input type="checkbox"/> most past and present tense inflections, plurals
	Handwriting (specified only to level 3)
	<input type="checkbox"/> legible style, shows accurate and consistent letter formation, sometimes joined

The SATs marking schemes collapsed the AF into three main strands. The first of these was sentence and punctuation, focussing on syntax, punctuation and use of sentence structure. The second, text structure and organisation, assessed writing at paragraph and discourse levels and highlighted sequencing and coherence. The third strand was composition and effect and focussed on imagination, interest, and appropriateness to task and reader.

Overall, it can be seen that the AF largely reflected the NC for writing.

3.3 Vocabulary

As previously discussed, the not-so-simple view of writing (Berninger & Winn, 2006) divided text generation into word-, sentence- and discourse-levels. Underlying knowledge at each level performs distinct functions in promoting compositional quality, for example accurate expression of meaning is dependent on vocabulary knowledge (see McNamara, Crossley, & McCarthy, 2010). Dockrell et al. (2016) showed that primary school teachers emphasised word-level work even more than sentence- and discourse-level work.

Key Stage 2 writing is, nonetheless, assessed largely through discourse-level writing, with comparatively little emphasis being placed on vocabulary in APP or in Key Stage 2 SATs. This could be regarded as a potential weakness in these assessment procedures. For example, in APP there are eight assessment foci and only one is concerned with vocabulary. At level 4, criteria for awarding marks for AF7 (vocabulary) were ‘some evidence of deliberate vocabulary choices’ and ‘some expansion of general vocabulary to match topic’. This comparatively vague wording contrasts markedly with the specificity of other AF criteria, as shown in table 4.

SATs vocabulary criteria at the time of data collection, while more specific, were nonetheless also brief for each level of attainment, as shown in table 5. However, technical terminology, vividness, precision and genre appropriateness were included at levels 4 and 5. (Children in Year 5 were expected to achieve level 3-4.)

Table 5 SATs writing English assessment expectations for vocabulary, levels 2-5

Level 5	<ul style="list-style-type: none"> □ Vocabulary predominantly appropriate to text type and genre. Precise word choice may create impact and augment meaning. □ Varied stylistic features may support both purpose and effect, e.g. alliteration, metaphors, puns, emotive phrases.
Level 4	<ul style="list-style-type: none"> □ Ideas and events developed through some deliberate selection of phrases and vocabulary, e.g. technical terminology; vivid language; word choice for effect or emphasis. □ Some use of stylistic features support purpose, e.g. formal / informal vocabulary; appropriate use of similes.
Level 3	<ul style="list-style-type: none"> □ Some detail / description of events or ideas expanded through vocabulary (simple adverbs, adjectives) or explanation. Some vocabulary selected for effect or appropriateness to task.
Level 2	<ul style="list-style-type: none"> □ Some detail included through adventurous word choice appropriate to task (a big, hairy caterpillar...Mr. Jones looked cross...bears are fierce...).

3.3.1 Lexical richness

There is ongoing interest in assessment of lexical richness of vocabulary (e.g. Crossley & Kyle, 2018; G. J Williams, Larkin, Coyne-Umfrerville, & Herbert, 2019) since it provides a measure of word-level text generation capability. Moreover, lexical richness of vocabulary has been shown to predict compositional quality in standardized assessments (Kyle, Crossley, & Berger, 2018; Olinghouse & Wilson, 2013). A number of variables have been investigated, including word length, word frequency, vocabulary diversity, content vocabulary (topic related) and register (ratio of Latinate:Germanic words).

Lexical richness scores have also been shown to be genre-sensitive, for example as demonstrated by Olinghouse and Wilson (2013). Their study compared writing in three different genres by Grade 5 children (10-11

years) using the narrative writing task in TOWL-3 (Hammill & Larsen, 1996) and similar experimenter-designed tasks for persuasive and informative writing. Each sample was scored for overall writing quality and also for lexical richness. It was found that the percentages of variability in writing quality which were uniquely explained by each measure of lexical richness were:

- narrative: vocabulary diversity (8%)
- persuasive text: content words (8%), register (5%)
- informative text: content words (31%), maturity (3%)

(maturity: words not in 'a general service list of English words'; West, 1953).

3.4 Key points and conclusions

Chapter 3 reviewed the UK NC for handwriting, spelling and compositional writing, and described assessment procedures related to the NC. In addition, it compared the NC and statutory assessment with theoretical frameworks for writing skills laid out in chapter 1.

The Key Stage 2 NC for writing broadly reflects the simple view of writing (Berninger & Amtmann, 2003). Nevertheless, the NCs for spelling and composition could be argued to have a stronger theoretical basis than that for handwriting, and much less detail is provided for handwriting than for spelling or composition.

The NC for handwriting current when data collection for this project occurred appeared to assume that children's handwriting skills were sufficiently well-developed by the age of nine and that there was no necessity for further instruction. There was minimal modification when the new NC was introduced. However, handwriting skills are likely to develop throughout primary school, at least in part due to lack of maturation of distal motor control for most children until at least 10 years of age. Lack of

instruction in Years 5 and 6 is consequently not in keeping with research evidence since skills are unlikely to be fully developed.

Consistency of style until children approach automatization would appear likely to enhance handwriting skill development. Despite this, there is no national handwriting style in the UK, unlike countries such as France, and children may move schools during primary education. Furthermore, handwriting neatness and extent of joining appear more emphasized than automaticity/speed despite being considerably weaker promoters of compositional quality (Medwell et al., 2008, and others). In APP and SATs, few marks are available for handwriting and these are awarded for accuracy rather than any measurement of speed. At minimum, a word count in Key Stage 2 writing assessments would provide useful additional information.

Although the NC for spelling in primary school reflects dual route models of spelling via synthetic phonics for younger children, and subsequently multiple resource theories of spelling, SATs and APP assessments of spelling are inconsistent. SATs record solely the proportion of errors in a test of single word spelling (rather than in the context of connected text). In contrast, APP reflects the NC for spelling more closely since it records successful use of spelling strategies in connected text.

An important omission from the NC for writing is the widely-accepted positive association between handwriting and spelling automaticity, and compositional quality. Formal spelling instruction ceases when children leave primary school and handwriting instruction ends even earlier. Nonetheless, some students still experience cognitive overload stemming from transcription post transition to secondary education (e.g. Connelly et al., 2005; Montgomery, 2008).

The NC for compositional writing is comparatively detailed and incorporates various features of the not-so-simple view of writing (Berninger & Winn, 2006). Writing SATs and APP focus on genre-knowledge and discourse and paragraph organization, along with

grammatical accuracy and structural variation at sentence-level text generation. However, although vocabulary is an important component of the NC, comparatively few marks are awarded for it in APP and SATs. Estimation of lexical richness would be an additional tool for assessment. Written vocabulary generation relies on the same limited resource of working memory as handwriting, spelling, executive functions and the remainder of text generation. As discussed in the thesis introduction, certain groups of children, for example boys and younger children, have been found to use less sophisticated vocabulary in their writing. This may constitute a partial explanation for lower attainment in writing amongst these students. Knowledge of children's written vocabulary usage is consequently important.

Rationale for studies carried out in this project

Despite ongoing research, compositional quality of children's writing continues to cause concern. This project examined writing in Year 5 (age 9-10) in order to provide insight into a series of factors influencing performance which have not previously been investigated. The overall aims were (i) to describe classroom practice in writing in terms of teachers' beliefs and attitudes about writing tuition and the content of students' written production and (ii) to examine the effects of writing environments on the relationship between transcription and quality of text generation.

Seven studies were conducted to investigate the issues raised above.

1. Do teacher-beliefs, training and classroom practice reflect evidence-based recommendations for writing tuition?

There are many factors which may influence the effectiveness of classroom practice. The surveys of primary writing tuition reviewed in chapter 2 provide information on aspects such as timetabling, perceived adequacy of training and relative prioritization of teaching objectives. However, there is little in-depth knowledge about others, for example teacher awareness of evidence-based recommendations for writing skills tuition, their attitudes toward curricula and assessment, and their professional beliefs and childhood experiences of writing at school, all of which have been implicated in influencing classroom practice (Ball, 2003; Kistner, Rakoczy, Otto, Klieme, & Büttner, 2015; and others). In order to analyse the influence of teacher factors on the effectiveness of writing tuition, it is necessary first to understand and describe these phenomena in depth. To this end, nine primary school teachers were interviewed about writing tuition.

Main Aims

There were three main aims of Study 1: (1) to gain insight into the extent to which teacher beliefs and practice incorporated evidence-based teaching recommendations, (2) to ascertain whether participants felt that their

training in handwriting tuition was adequate and (3) to review classroom practice during written literacy lessons as reported by teachers.

2. A categorisation of classroom writing environments

The Study 1 interviews provided rich information about teacher beliefs and practice which might impact on everyday writing tuition. However, little is known about the words which are committed to paper by children in real-life classroom settings.

Whilst schemes have been drawn up to enable classification of all work written by children into definable writing environments, these have been very few in number (Brindle et al., 2016; Coker et al., 2016; McHale & Cermak, 1992b). In addition, since they were observation or survey studies, little record was made of content. There is in consequence a lack of knowledge about the words which children actually write in class.

Aim

The aim of Study 2 was to transcribe and describe the entire range of writing tasks undertaken by Year 5 children during one typical school week and allocate each item of writing to one of three writing environment categories: teacher-generated (T-gen), teacher + child-generated (T+C-gen) and child-generated (C-gen).

3. Handwriting and spelling characteristics of written output

Building on Study 2 which described writing environments in the classroom, Study 3 focused on the nature of transcription (handwriting and spelling) in each of the categories. There is a limited resource of working memory available to support writing (Berninger & Winn, 2006). A potential consequence is competition between handwriting and spelling. This is particularly the case for those whose transcription skills are not yet fully developed, and children's handwriting and spelling skills continue to

develop throughout primary school (Palmis et al., 2017; Treiman & Kessler, 2014).

Improvement in transcription skills depends on practice. The amount of cross-curriculum writing is determined by teachers and is likely to differ between classes. Little is known about inter-child variation in amount of handwritten work or child- or class-level spelling accuracy. Moreover, there is a lack of knowledge about how differences between writing environments impact on amount of transcription practice occurring.

Aim

The aim of Study 3 was to compare the amount written by children in eight Year 5 classes and their spelling accuracy in the three classroom writing environments described in Study 2 (T-gen, T+C-gen and C-gen), and to investigate associations between handwriting and spelling performance.

4. Links between transcription and word-level text generation

Study 3 showed that there was a marked variation in amount of writing carried out during the data collection period, both between children and between school classes. This implies that, the amount of practice in transcription differed widely. Acquisition of transcription skills is dependent on practice and, until transcription skills are well-developed, working memory resources available for text-generation may be limited (Kellogg et al., 2013; McCutchen, 1996). Consistent with this, both handwriting automaticity and spelling accuracy have been shown to predict compositional quality (Graham et al., 1997). However, it is not known whether this relationship is reflected in everyday classroom work or whether the effects of writing environments on compositional quality are significant.

Aim

The main aim of Study 4 was to investigate links between transcription and the quality of word-level text generation. More specifically, the associations between the amount written or accuracy of spelling in T-gen or

T+C-gen writing environments and the lexical richness of C-gen writing were explored.

5. Spelling strategies in copied and child-generated writing

Study 4 showed that while C-gen lexical richness was not significantly associated with amount of T-gen writing completed there was a significant association between C-gen lexical richness and the amount of T+C-gen writing. Study 5 followed up the first of these findings through an investigation of spelling strategies in C-gen and T-gen writing, in order to elucidate potential links between depth of processing and efficiency of vocabulary acquisition during writing.

Working memory demands when children are copying may be considerable. There is repeated cycling of visual encoding and transcription, but letter-span may be insufficient for longer words (Laishley et al., 2015). In addition, spelling and letter position coding are unlikely to be automatized. Vocabulary learning is dependent on deep processing (Perfetti, 2007), itself a cognitively demanding process, in which semantic, phonological and orthographic information is integrated. Possible consequences of cognitive overload during copying are shallow processing of unfamiliar vocabulary, inefficient vocabulary learning, and a tendency towards phonologically implausible spelling errors due pronunciation uncertainty and inaccurate repositioning on source text.

In contrast, it is very probable that children understand the meanings of words which they use in C-gen writing (Dobbs & Kearns, 2016). The phonological 'inner voice' (Torrance & Galbraith, 2006) is likely to include phoneme sequences. If the 'inner voice' is used to facilitate spelling attempts it might be expected that spelling errors, where these occur, would be more likely to be phonologically plausible.

Aim

The main aim of Study 5 was to investigate differences in the phonological plausibility of spelling errors in order to clarify spelling strategies when children are either copying or producing C-gen writing.

6. Transferring vocabulary from classroom learning to genre-writing

Study 6 followed up the other main finding of Study 4: lexical richness of vocabulary in C-gen writing was positively associated with the amount of T+C-gen writing completed.

Words used in C-gen writing are sourced from long-term memory. A prerequisite of storage in long-term memory is deep processing (semantic, phonological and orthographic) of currently unfamiliar vocabulary (Perfetti, 2007). Both T-gen and T+C-gen writing involve committing newly encountered words to paper. However, unlike copying in T-gen writing, T+C-gen writing also incorporates children generating sentences using that vocabulary, individually but with teacher-support. In order to generate text which makes sense, there must be an understanding of the meaning of the unfamiliar words. In T+C-gen writing this is likely to stem from verbal explanations by teachers (e.g. during explicit teaching). Exposure to the pronunciation of novel words also generates phonological knowledge which is likely to facilitate spelling attempts. Together, these factors are likely to promote creation of word representations in long-term memory. The processed new vocabulary would therefore be available for use in subsequent C-gen writing.

Aims

The main aim of Study 6 was to examine links between written vocabulary in T+C-gen genre-writing preparation sessions and its subsequent use in the genre-writing task itself. An additional aim was to investigate whether there were effects of class, genre, or type of preparation on genre-writing scores.

7. Predicting compositional quality of genre-writing

There is widespread acceptance that variables such as age within the school year and use of EAL affect writing performance (Cameron & Besser, 2004; Crawford et al., 2007). However, many other potential predictors remain to be investigated and several have been investigated in this project, for instance teachers' perception of the adequacy of their preparation for handwriting tuition or the effectiveness of different writing environments.

Studies 1-6 considered a broad range of factors which may influence compositional quality. From these, a group of potential predictors of text-generation quality was selected for use in the final study in this project. The variables were chosen because they were of particular theoretical interest, for example T-gen vs. T+C-gen letter-counts. In addition, factors previously shown to predict compositional quality were included in order to compare strengths of effects.

Aims

The aim of Study 7 was to identify predictors of genre-based writing scores of compositional quality from a range of child-level, teacher-level and writing environment-level factors.

4 Study 1 DO TEACHER-BELIEFS, TRAINING AND CLASSROOM PRACTICE REFLECT EVIDENCE-BASED RECOMMENDATIONS FOR WRITING TUITION?

4.1 Introduction

Concern about the quality of children's and students' writing in the UK, US and other countries is well documented (see, for example, Dockrell et al., 2016). The effectiveness of tuition is consequently of considerable significance. Effectiveness is influenced by a series of factors, for instance teacher beliefs and training, classroom practice, the NC and school handwriting policies, as discussed in the literature review chapters. However, little is known about the extent to which these factors are consistent with evidence-based teaching recommendations.

Teacher identities are a product of personal and professional values and school priorities (Wilkins, 2015). Teacher-values and their beliefs might derive from, for instance, childhood experience of education, ongoing teaching experience, and the predominant educational philosophy during initial training (Graham & Harris, 2014; Miller & Shifflet, 2016; C. Stuart & Thurlow, 2000; Wilkins, 2011). As shown in the teacher surveys reviewed in chapter 2, beliefs and practice sometimes diverge, as a consequence of factors such as time pressure and lack of materials. Comparing teacher beliefs, classroom practice and research-based teaching recommendations offers a potential avenue for promoting teaching effectiveness.

Primary school teachers often seem to be expected to have highly-developed expertise across the curriculum, which is unrealistic. However, evidence

from the teacher surveys outlined previously suggests that many felt under-prepared for writing tuition following their initial training (Barnett et al., 2006). Once in service, teachers have limited time for further training and there is inevitable prioritization, based partially on individually perceived need in specific curriculum areas. If there is insufficient clarity of communication between educational researchers and educational practitioners about research-based teaching recommendations (see Graham & Harris, 2014; Graham et al., 2016), teachers may not be in a position to make fully informed choices about their training needs.

As shown in chapter 2, there have only been two UK based teacher surveys of primary school writing tuition and no interview studies focussing on Key Stage 2 writing. In consequence, little is known about teachers' perceptions of either the NC for primary school writing or school writing policies, or the extent to which each influences individual teacher's classroom practice. Generalisation of findings from other countries is inappropriate owing to curriculum differences. There is also a lack of knowledge about UK teacher-perceptions of writing assessment, including statutory testing. In addition, there is little knowledge of classroom practice associated with writing in UK primary schools. A detailed exploration of teacher views would provide useful background knowledge to facilitate the design of further large-scale surveys. When sufficient studies have been completed they, in turn, may provide evidence relevant to policy making.

The purpose of Study 1 was to provide a rich insight into teacher beliefs about acquisition of writing skills, curricula, policies and the adequacy of teacher training, and the ways in which these impact on classroom practice. In addition, it provided background information to facilitate interpretation of the remaining studies in this project.

4.2 Aims and research questions

Main Aims

There were three main aims of Study 1: (1) to gain insight into the extent to which teacher beliefs and practice incorporated evidence-based teaching recommendations, (2) to ascertain whether participants felt that their training in handwriting tuition was adequate and (3) to review classroom practice during written literacy lessons as reported by teachers.

Research questions

1. What beliefs were held by the teachers about:
 - a) handwriting and writing skill development?
 - b) the extent to which handwriting skills are related to quality of composition?
 - c) whether there should be active promotion of handwriting speed?
 - d) associations between handwriting and spelling skills
2. School handwriting policies and teacher training in writing tuition
 - a) How did the teachers think that school policies and the NC for writing impacted on their classroom practice?
 - b) Did teachers feel that they had received sufficient training in teaching handwriting?
3. How did the teachers operationalize their pedagogy with regard to:
 - a) amount of dedicated handwriting tuition given?
 - b) procedures for monitoring and evaluating handwriting and writing?
 - c) the types of feedback on handwriting and writing given to children?

4.3 Method

4.3.1 Participants

4.3.1.1 Schools

Twelve state-funded U.K. primary schools were approached as potential participants in studies 1 and 2. All were in rural Oxfordshire. Six schools agreed to take part (Schools 1 to 6, see Table 6). Reasons given for non-participation included change in head teacher, head teacher illness, frequent participation in previous university research projects and proximity of the end of the school year.

Since there is substantial variation between schools, interpretation of the results of studies with small sample sizes is potentially problematic. In consequence the potential participating schools for study 1 had been deliberately selected on the basis of their comparative homogeneity. Homogeneity was considered in terms of percentages of children in three key demographic categories: with/without FSM, EAL, or SEN. Overall absence rate was also taken into account. In addition, all participating schools were in rural Oxfordshire, avoiding urban vs. rural variation and other geographical factors.

Schools 2-6 had less than average rates for FSM, EAL, and SEN when compared with English primary schools as a whole. School 1 had 25% children with EAL, primarily due to location of a higher education establishment with substantial numbers of overseas students within its catchment area. Absence rates at the schools were average or below-average. Table 6 shows the percentages of children falling into the categories listed above at each participating school. Values for both English and Oxfordshire primary schools are included to enable comparison.

Table 6 Characteristics of participating schools

	Number of children on school roll	FSM % ¹ (DfE, 2012a) (2011- 2012)	EAL % ² (DfE, 2012a) (2011- 2012)	SEN % ³ (DfE, 2012b) (2011- 2012)	Overall Absence Rate % ⁴ (DfE, 2013b) (2011- 2012)
English primary schools	251	19	18	17	4
Oxfordshire primary schools	213	11	11	16	4
Participating schools					
1	265	4	25	2	5
2	157	3	0	5	4
3	109	MD ⁶	0	4	4
4	69	9	0	4	4
5	109	13	3	11	5
6	222	6	MD	4	4

¹ FSM: child who qualifies for free school meals

² EAL: child who speaks English as an additional language

³ SEN: child with special educational needs

⁴ Overall Absence Rate

⁵ MD: missing data

Table 7 compares the Ofsted gradings of the overall quality of the participating schools. The reports for each participant school reflected the Oxfordshire distribution of primary school quality: outstanding 11%, good 62%, 28% satisfactory, inadequate 2%. National percentages were: 21% outstanding, 49% good, 28% satisfactory, 3% inadequate (Ofsted, 2012d).

Table 7 Participating school performance as rated by Ofsted

Participating schools	Ofsted Grading from most recent Ofsted report
1	Good
2	Good
3	Good with elements of outstanding
4	Good
5	Satisfactory
6	Satisfactory

Schools 2-6 all had enrolments smaller than the average for English primary schools (see table 6) and schools 2-5 for those in Oxfordshire. Because of the small size of the participating schools most of the classes in them included children from more than one Year.

4.3.1.2 Teachers

Nine primary school teachers took part, 8 female, 1 male (see table 8). They are referred to here by aliases. All classes included Year 5 children, the age-band chosen for this project due to converging evidence that morphokinetic motor control is reaching maturity at this age thus enabling relatively automatized writing, as discussed in chapter 1.

Table 8 Characteristics of the participating teachers

School	Class	Year groups in classes	Teacher alias	Years teaching	Years teaching at current school	Approximate length of interview (minutes)
1	1	Year 4 & 5	Allie	12	12	45
1	3	Year 5	Bridget	10	10	45
2	2	Year 4 & 5	Chris	19	9	60
2	6	Year 5 & 6	Di	16	15	30
3	4	Year 5	Esther	5	5	60
3	4	Year 5	Felicity	3	3	45
4	7	Year 5 & 6	Gill	20	4	30
5	8	Year 5 & 6	Hannah	10	7	60
6	5	Year 5	Izzy	13	5	15

4.3.2 Ethical approval

Ethical approval was given by Oxford Brookes University's Research Ethics Committee (see Appendix A, Appendix B, and Appendix C) for letter to head teacher, teacher information sheet and consent form).

Head teachers were first approached by letter and telephone. Those who expressed an interest in possible participation were offered the opportunity to hear more details about the research in a meeting at the school. If the head teacher gave permission, the study was explained to the relevant class teachers who were then asked by the head teacher if they would like to take part.

It was clearly necessary to be sensitive to participant perspectives in terms of scrutiny of practice within the workplace. Teachers are evaluated, for

instance in Ofsted inspections, and such scrutiny may be unsettling. The meaningfulness of the answers given in the interviews and consequently the validity of the study findings meant that it was imperative that being interviewed was seen as neither stressful nor judgemental.

The interviews were individual and took place at the schools in settings selected by the participants and at times suggested by them. It was ensured that there was ample opportunity to discuss the contents of the information sheet and rationale for the investigation before the interviews took place. It was important to build rapport with the participants and the interview proper did not start until the participant concerned seemed at ease.

4.3.3 Researcher assumptions

My experience as a specialist one to one teacher of children with specific learning difficulties and my theoretical knowledge of handwriting motor skill development and writing brings me insight but may have caused my interpretation to be biased by conclusions formed before the research started. I countered this by continuing personal cross-examination at each stage of the data collection and analysis processes. Examples of this process are the ordering of interview questions to minimize my impact on those which might reveal tacit beliefs, and consideration of conclusions alternative to those I had reached. In addition, my supervisors were given the opportunity to identify themes independently as a means of verification. Any differences were resolved by discussion, an example being refining names of themes.

4.3.4 Data collection

4.3.4.1 Schools: Handwriting policies

School handwriting policies were obtained from head teachers to enable extraction of details, pertinent to interview interpretation.

4.3.4.2 Teacher interviews

Data was collected using semi-structured interviews (see interview script, Appendix D). The questions were derived from the models handwriting, spelling and writing described and compared in chapter 1; the findings of meta-analysis of intervention studies and teacher survey discussed in chapter 2, and handwriting, spelling and writing policies and curricula and assessment procedures described in chapter 3. Aspects such as ergonomics (e.g. chair height) and paper positioning were not included since they did not fall within the scope of this project.

The first two questions were closed and factual and used to collect demographic information:

- For how long have you been a class teacher?
- How many years have you taught in this school?

The next was the first open question:

- What do you think is important in the teaching of children's handwriting?

The purpose of this question was to give participants an opportunity to express their personal feelings about what is important in the teaching of handwriting, in order to allow comparisons between their beliefs and teaching practices and knowledge of research-based teaching recommendations. It was decided that it should be the first open question since the teachers' interpretation might be affected by the more specific issues introduced later in the interview. Any supplementary questions associated with this particular question were specific to each participant.

Subsequent questions were principally based on research-based recommendations writing tuition as a whole. If it was felt necessary to

encourage the teachers to develop their answers further, the additional probes used were the same in each case.

Seven of the nine interviews were audio recorded. Two teachers elected for their interviews to be recorded in note-form. In these cases a few phrases were recorded verbatim since the wording was felt to be particularly relevant.

There were two pilot interviews following which there were minor changes to the wording of questions. The pilot participants' responses were not included in the final analysis.

4.3.5 Coding and themes

A thematic analysis was carried out (Braun & Clarke, 2006). Despite the theoretical nature of the majority of the questions the intention was for the themes to be emergent and the names of the themes did not reflect the wording of the interview questions. The coding was comprehensive, aiming to give equal attention to each identified data item. I developed the themes from the data and they were refined to promote their distinctiveness, coherence and consistency. There was frequent comparison with the transcripts to ensure that the themes were representative. In addition, the analysis was also recursive with frequent cross-referencing to other stages in the analysis. The sequence of actions and recursive processes are shown in Table 9 and figure 3.

Table 9 Summary of the investigative stages in thematic analysis (see Braun & Clarke)

Stages

Transcription

The audio recordings were transcribed verbatim and checked against the original data. For the two interviews conducted using note-taking, the data included any quotations which were recorded verbatim.

Familiarisation

The transcripts were read sufficiently frequently to obtain familiarization with the range and depth of content. Notes about content were made. This enabled a preliminary search for potential patterns in the data.

Coding

Relevant features of the raw data were highlighted, which facilitated their organisation into meaningful semantic categories. In addition, quotations which conveyed thought-provoking insights were identified.

Identifying themes and sub-themes

The codes and their associated data were sorted into prospective emergent themes. Any potential sub-themes were noted and the relationships between these levels considered.

Reviewing

The themes were refined by: checking cohesiveness of the data within each, collapsing similar themes together or dividing those lacking homogeneity, and deciding whether the overall sense of the data was reflected by the set of themes.

Defining

The content of each theme was defined. The relationships between themes were clarified, overlaps discerned and sub-themes identified. Names which reflected the central concepts of the (sub-)themes were selected.

Reporting

The report included direct quotations from the interviews and an analysis exploring the meaning of the data.

Investigative stages and recursive processes

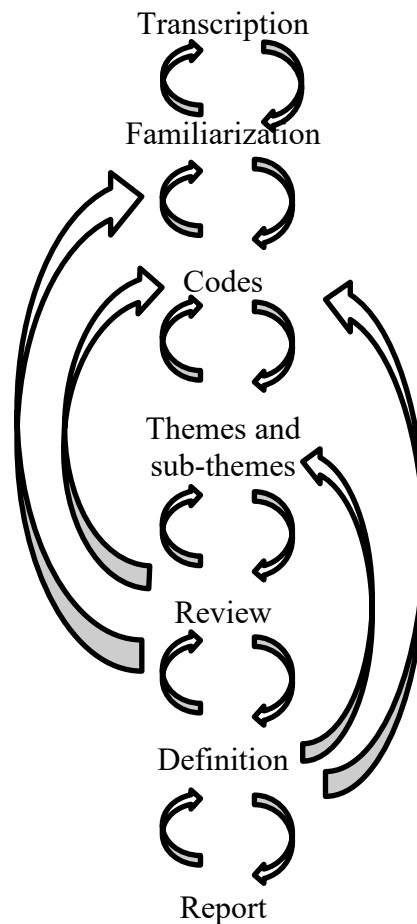


Figure 3 The investigative processes in the analysis of the interview data

Table 10 summarizes the development of the themes in study 2. Six potential themes were developed from the coding. The initial theme of ‘Relationships between handwriting speed, neatness, and compositional quality’ was divided into two since it lacked homogeneity. The same was the case for ‘Knowledge of handwriting policies and adherence to them’. The participants did not appear to define the terms ‘monitoring’, ‘evaluation’ and ‘feedback’ consistently. In consequence, the data was subsumed into a category of ‘Feedback on handwriting’ which included pupil self-evaluation.

Table 10 Thematic development, including the initial and final versions

Initial	Final
Cognitive load in writing	Awareness of cognitive load
Relationships between handwriting speed, neatness, spelling and compositional quality	Speed vs. neatness: a cognitive dissonance
	Linking handwriting, spelling and text generation
Attitude to governmental policies	Handwriting and composition
Ownership of school handwriting policies	Teachers ownership of school handwriting policies
Tuition in writing and handwriting	Teaching composition
	Organizing handwriting tuition
Feedback	Checklists and feedback
	Handwriting and confidence

4.4 Results

4.4.1 School handwriting policies

The school handwriting policies are compared in table 11. It suggests that schools 1, 3 and 4 had the most detailed handwriting policies and 2 and 6 the least. The most recently reviewed were in schools 1, 3 and 5, and these were both documented and verbal entities. Since there was only a verbal policy in school 6, it was only possible to gauge the contents from reports by the relevant participant.

Table 11 Comparison of school handwriting policies

(KS1: Key Stage 1; KS2: Key Stage 2)

School Teacher	1 Allie Bridget	2 Chris Di	3 Esther Felicity	4 Gill	5 Hannah	6 Izzy
Policy description						
Most recent policy/policy review	2011	2009/2010	2011	2009/2010	2011	
Type of handwriting policy	Documented and Verbal	Documented	Documented and Verbal	Documented	Documented and Verbal	Verbal
Explicit teaching and attainment expectations specified	KS1 by year; lower & upper KS2 separately		KS1 by year; lower & upper KS2 separately	KS1 by year; lower & upper KS2 separately	KS1 by year; KS2	KS1 by year; KS2
Frequency/length of handwriting tuition specified	✓		Specified by literacy coordinator	Specified by literacy coordinator	Specified by literacy coordinator	Specified by literacy coordinator
Policy coordinator stated	✓	✓	✓	✓	✓	✓
Evidence-based benefits						
Assessment procedures specified:		✓	✓	✓		
School style specified: (published scheme/example alphabet)	✓	✓	✓	✓	✓	
Teachers required to use school style	✓		✓		✓	✓
Legibility emphasised	✓	✓	✓	✓	✓	✓
Speed emphasised		✓	✓	✓		
Personalisation encouraged	✓		✓	✓	✓	
Extended writing opportunities offered	✓		✓	✓		
Evidence-based disadvantages						
Neatness/presentation strongly prioritised					✓	✓

4.4.2 Interview analysis

Figure 4 combines the topic areas covered by the main research questions (shown at the head of the diagram) and the themes and sub-themes subsequently developed from the interview data. Following figure 4 each theme and sub-theme is explored in detail. For each there is an initial background section providing information necessary for interpretation of the data. Since the themes range from underlying understanding of skill acquisition and teacher beliefs to real-life classroom practice, the background knowledge is derived from a variety of sources, for example models of writing and classroom timetables. Next the data are presented, starting with a summary table showing which teachers have contributed to each sub-theme and including quotations to illustrate the narrative. Finally there is a brief summary. Following the eight themes, there is a discussion of the findings associated with each research question.

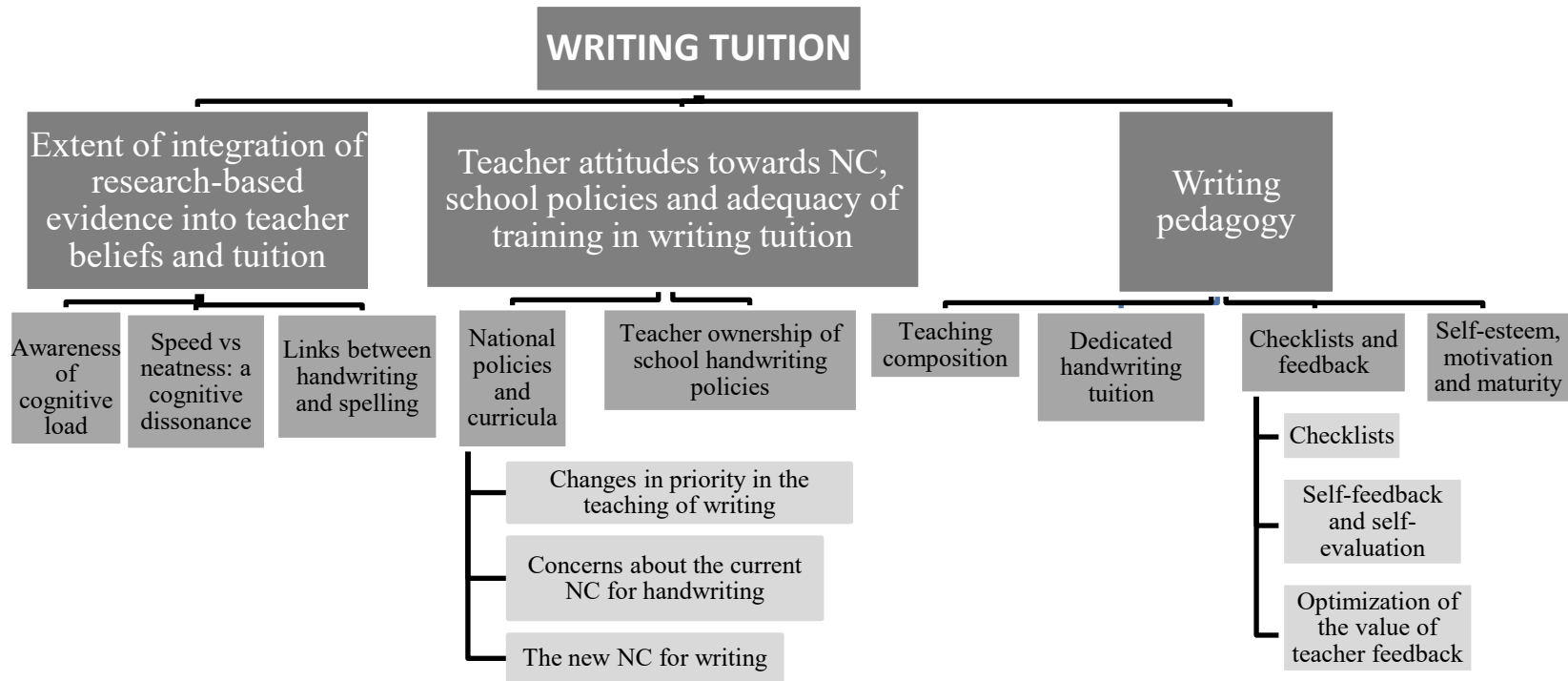


Figure 4 Research question topic areas (white print), and themes and sub-themes (black)

4.4.2.1 Theme 1: Awareness of cognitive load

Background information

Writing is a taught skill, and awareness of basic principles of skill acquisition is likely to increase teaching effectiveness. This knowledge includes, for example, appreciation of the considerable demands placed on memory reserves when children are learning new skills, the necessity for practice in order to reduce the demand and the positive relationship between competence in transcription and compositional quality. Teachers may acquire knowledge about the effects of working memory demands on writing outcomes from various sources, for instance initial training, INSET or classroom experience, but little is known about the extent to which this awareness affects classroom practice. Theme 1 illustrates how the participants in Study 1 conceptualised cognitive load and its effects.

Data for Theme 1: Awareness of cognitive load

As shown in table 12, seven of the nine participants expressed views about handwriting tuition in the context of relationships between compositional quality and, for example, handwriting style requirements and developmental trends.

Table 12 Theme 1: Cognitive load

(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Ally	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Awareness of cognitive load	✓	✓	✓		✓	✓	✓	✓	

Awareness of cognitive load

Allie, Bridget, Esther, Felicity, Gill and Hannah emphasised the necessity for practice during the handwriting skill acquisition period, with Allie explaining to her pupils that it was like learning to ride a bicycle:

You don't get on a bicycle and ride it brilliantly the first day; it's about practising over and over again – that's what makes it better.

There was recognition of the competing demands of lower- and higher-level processing of writing. Hannah compared simultaneous acquisition of handwriting and higher-level writing skills with learning to drive:

It is like when you have got the clutch ... how they are feeling when we are telling them to do all these different things at once ... thinking about the creative process at the same time.

Similarly, Bridget, Esther and Felicity discussed the reciprocal relationship between transcription accuracy and quality of text generated :

Bridget: Neatness is one of the things that goes out of the window, especially if they are interested in what they are writing about ... one too many balls to juggle.

The participants also demonstrated understanding of the problems children face when required to alter motor programmes associated with handwriting styles. They described situations in which this may arise, for example when children move schools or even between classes at the same school, change from un-joined to cursive handwriting or school handwriting policies are reviewed. Esther and Felicity emphasised the need for a consistency of style throughout a school.

Felicity: A child could learn one style in Year 1/2 and then in Year 3/4 it could change completely, and then Year 5/6 completely different again.

In addition, Esther had worked in France and Allie's school has a large proportion of children whose parents are temporarily in the U.K. Both pointed out that a national handwriting style might be beneficial.

Felicity explained that when the new school handwriting policy was introduced at the start of the current academic year, children who already

had effective legible and joined handwriting were not expected to change their handwriting. Some of these children did nonetheless try to change to the new school style but:

Their work just so much deteriorated in terms of the quantity and quality.

Allie and Bridget described the reduction in quality of composition while children were transitioning from manuscript to cursive handwriting:

Allie: some children spend so much time focusing on joining their writing that the composition goes astray.

Esther noted that the older children were the harder it was for them to change their handwriting style; she and Felicity described how modifying detrimental handwriting movement habits is also costly.

Esther: He holds the pencil in a really uncomfortable way ... if he tries ... a more comfortable hold he can't then spell the words accurately or write them at speed.

Participants who had taught several primary school Years tended to agree that this experience improved their teaching of handwriting since this put the decrease in cognitive load as skills improve into a developmental context. Nonetheless, Allie and Chris's awareness of developmental differences lead them to feel that attainment targets by school Year were inappropriate.

Chris: With staff who have just taught one single year group, there is an expectation that children will fit into more conformity, but when you start to see them over a range of ages having developed from initial marks right through to cursive script ... I think you have a better understanding of the process they have gone through.

Nonetheless, all of the participating schools had attainment targets for handwriting, consistent with the NC, and Bridget and Esther found that a year-by-year framework of handwriting expectations was helpful.

Following her previous experience of eight years' teaching Year 3-4, Bridget concluded that:

You need to know where children come from and where they are going to make sure that they are where they should be.

Summary Theme 1: Awareness of cognitive load

The interviews demonstrated that the teachers were aware of issues surrounding the interaction of lower- and higher-levels of processing in writing. In order to discuss them, the participants used similes rather than formal terms such as automatic, automaticity and cognitive overload. The necessity for practice was widely recognised and one participant clearly described the beneficial effects of automatization. The teachers recognised circumstances in which there may be cognitive overload, and they associated these changes with reduction in quality of either transcription or higher-level elements in writing. Most teachers felt that teaching a wide range of primary school Years had increased their understanding of the development of handwriting skills. Some were wary of age-related attainments targets since developmental rates are variable, although others found that a framework was helpful.

4.4.2.2 Theme 2: Speed vs. neatness, a cognitive dissonance

Background information

Studies into the relationships between compositional quality and handwriting speed or neatness have shown that whereas handwriting speed is a strong predictor of quality this is much less the case for neatness, with a consequential potential for compositional quality to reduce if too great a weight is placed on the importance of neatness. Despite this, Barnett et al. (2006), Medwell et al. (2007) and Medwell and Wray (2014) indicated that some schools put a greater emphasis on neatness/presentation than speed. The NC uses the words 'legibility' and 'speed'. Most schools participating in the current project incorporated the word 'legible' as well as 'neatness' and 'presentation' in their handwriting policies but rarely 'speed'. The teachers who took part referred to 'neatness' and 'presentation' considerably more than 'legibility' or 'speed' (indeed some teachers considered that writing quickly was undesirable since neatness and presentation might be compromised).

Data for Theme 2: Speed vs. neatness, a cognitive dissonance

All participating teachers discussed their beliefs about speed, neatness and compositional quality, as shown in Table 13.

Table 13 Theme 2: Speed vs. neatness, a cognitive dissonance

(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Ally	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Speed vs. neatness: a cognitive dissonance	✓	✓	✓	✓	✓	✓	✓	✓	✓

Speed vs. neatness, a cognitive dissonance

Only three teachers expressed consistent (if contrasting) views about the relationships between handwriting speed, neatness and compositional quality throughout their interviews. Felicity felt that there was little association between neatness and quality of content and that speed was of greater significance. As a Year 5-6 teacher, she felt that preparing children for SATs and the demands on handwriting skills which they would encounter at secondary school, particularly the necessity for rapid writing, was an important responsibility. She was the only teacher who actively promoted speed in handwriting lessons but found it difficult:

I don't know how to do it – which is not a great thing to have to admit. I try to give them a time limit ... I go round and try and help ... make their letters a bit smaller if they are doing big loopy letters, some of them it is pencil hold ... There's not a lot you can do because you adjust them ... go over to another table, come back and they are back in the poor grip and you could do it every day and it doesn't seem to make a lot of difference.

Gill, another Year 5-6 teacher, sometimes asked her pupils to try to write quickly, again with SATs testing in mind. She had also evolved a strategy for helping children on the autistic spectrum, explaining to them that it was necessary to write about 120 words to get a level 4 in SATs (i.e. relating

amount written to quality) and felt that this had been effective. In terms of the link between neatness and quality of composition she explained, “60% of the time decent writers have decent handwriting”. Esther believed that speed and neatness were linked and thus both were associated with compositional quality. She considered that improvement in handwriting speed was a function of learning to use the school style accurately, a consequence of which was neatness:

I think it's got to be somewhere in the middle. Being really finicky about the handwriting means that they forget some things ... but not caring means they can't reread and check and then it's a similar sort of thing. Somewhere in the middle.

Esther noted the quantity of handwritten work produced within a given timeframe, for example during the 15 minute handwriting sessions each day, so she was aware of speed of handwriting. However, she did not include speed promotion in her lessons and considered that increase in speed was a function of time:

You [and they] just have to be ... patient with them, and realise that they will speed up.

Several teachers appeared to be ambivalent about the relationship between handwriting speed, neatness and quality of composition. Whilst Bridget considered that handwriting speed contributed more to compositional quality than neatness she felt that children should do their best handwriting at all times, and that presentation was key, especially during handwriting practice. Nonetheless, she gave explicit information about output requirements before any handwritten tasks were undertaken and monitored the amount of writing which had been carried out:

I make it very clear what my expectations are at the beginning of the lesson. I will say how much writing I am expecting them to do, whether it is a page or paragraph or just a couple of sentences.

She considered that this contributed indirectly to speed of handwriting. Unlike Esther, Felicity and Gill, the purpose of the extended writing for Bridget was enabling teacher assessment of children's progress in writing.

Ally considered that there was little correlation between handwriting neatness and compositional quality and explained that composition was always more important than transcription. Despite this, neatness was obviously important to her as demonstrated when she questioned whether it is possible to write faster without compromising neatness.

I'd say handwriting speed is more important than handwriting tidiness ... but then I feel really guilty and feel that actually if I made them go slower, they'd end up being better.

Although Di felt that handwriting speed was more linked to compositional quality than neatness, she felt it was “*a bit of a compromise.*” She had not considered promoting handwriting speed but felt that it would be interesting to “*have some tips*”.

Chris also had ambivalent feelings about handwriting speed and compositional quality although he was clear that there was no association between neatness and quality. He explained that:

We have sort of a unwritten rule that within a 45 minute SATs writing paper by Year 6 that you'd be looking to be writing at least a page ... but that's more because ... it is very difficult to level a piece of work based on only a paragraph.

He mentioned that: “we don't have a handwriting speed scheme” or any overt expectation of a given amount of handwritten output: “they've pretty much unlimited time” in creative writing tasks. Nonetheless he was uneasy about lack of preparation for SATs in terms of handwriting speed:

Their ultimate assessment is based on a timed piece of writing and I wonder as staff whether we do enough, as a profession, do enough to equip the children for that one event ... how much preparation, how much practice does go on into the speed at which they write.

He related this to the conflict between teacher values and meaningfulness of assessment and explained that it is hard for teachers to admit to teaching to the test (i.e. SATs), also:

It would be rather arrogant of us not to provide the children with the skills to do well in the test, just to stick to principles in this sense, because that's how they are going to be judged.

Of all of the participants, Hannah appeared the most aware of the divergence between her viewpoints, clearly expressing the conflict between her belief in the importance of presentation and the lack of relationship between it and compositional skills.

As a mother, my son had dreadful handwriting and he is actually a very good writer ... but looking at his presentation of his writing, it has always been dreadful ... that's when I am in two camps because you know you think it is really important that it is beautiful and that, but then actually, he is a really good writer.

Summary Theme 2: Speed vs. neatness, a cognitive dissonance

Seven of the nine teachers stated that they considered that handwriting speed was more important than neatness in terms of generation of compositional quality. Two expressed this opinion consistently throughout their interviews and there seemed to be evidence of cognitive dissonance for at least four of the remainder. Only one discussed the divergences between her beliefs, the remainder appearing to be less conscious of them.

Only one teacher factored explicit promotion of handwriting speed into her tuition, motivated by her role in preparing children for SATs and secondary school. Another teacher periodically asked children to write more quickly, and two monitored level of output. At the other extreme one teacher explained the considerable conflict he felt between his professional views about appropriate conditions for creative writing and the responsibility to prepare children for time-limited tests such as SATs.

4.4.2.3 Theme 3: Links between handwriting and spelling

Background information

The NC for writing in England, recommends that spelling and handwriting should be taught in conjunction in Key Stage 1 in the context of phonics. Handwriting and spelling are not linked in the Key Stage 2 curriculum. As children move through Key Stage 2 there is an increasing expectation that they will use cursive writing and there appears to be a popular assumption

by teachers and others that spellings will be learned more effectively if children are using joined writing. There has, however, been very little research in the area. The findings in Alstad, Barnett, Connelly, Berninger, & Sanders (2015) tentatively suggest that there may be a link.

Data for Theme 3: Links between handwriting and spelling

Table 14 shows that all teachers participating in Study 1 commented on interrelationships between handwriting and spelling.

Table 14 Theme 3: Links between handwriting and spelling

(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Ally	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Links between handwriting and spelling	✓	✓	✓	✓	✓	✓	✓	✓	✓

Links between handwriting and spelling

Four teachers (Bridget, Di, Felicity and Izzy) emphasised the positive association between joining letters and spelling accuracy, which they attributed to the greater ‘fluidity’ and ‘flow’ evident in cursive writing.

Bridget: Joined handwriting – another reason, I try to give it a more high profile, because it does help spelling. They get the patterns of the letters ... it’s been proven to help spelling because children get the flow of letters in the words rather than individual letters, especially those children who find the physical process of writing these letters such a chore.

Both Di and Izzy concurred. Chris, however, cautioned :

You get ‘spelling is linked to cursive handwriting’ and then there will be a big push on learning cursive script at an earlier age because spelling has come up as an issue.

Felicity also valued the embedding of strong phoneme/grapheme correspondences which she felt was more effective when children are using cursive writing:

When I was teaching Year 1, we taught the letters separately, so not cursive, and then there were some real difficulties moving from that to joined letters because it didn't mean the same thing ... I think that it is really good now ... the children who are learning handwriting further down the school are learning cursive handwriting straight away, because I think that that association between the sound and the shape is really important.

There was some divergence of opinion about the purpose of linking of handwriting and spelling tuition for upper Key Stage 2 children. In Hannah's class, handwriting practice took the form of writing weekly spellings in handwriting book. However Gill took diametrically the opposite position:

On Friday mornings we do spelling, handwriting and grammar ... The handwriting is not linked to spelling.

Similarly, Allie's handwriting tuition, which was explicit and focused on letter and join formation, was not linked with spelling. There were some practical problems associated with linking handwriting and spelling.

Felicity was strongly convinced that learning grapheme-phoneme associations through using handwriting was beneficial, she explained that while the Year 3/4 class teachers try to build their spellings into their handwriting:

with mine I find that they need a lot of more differentiation because the spelling and writing abilities are so varied.

Both Felicity and Esther commented on the amount of copying which children are required to carry out at secondary school. All of Esther's class had comparatively well established handwriting skills, and she explained that handwriting practice was specifically aimed at copying accuracy.

I will give them a tick or I will say, you haven't copied this word quite right – have another look ... generally it is not the handwriting, it is the spelling, and the copying mistakes.

Allie also timetabled specific training in copying, for children with writing difficulties. She designed a scheme following online research:

They did 10 minutes of copying ... the TA talked to them at length about how to effectively copy, so putting your finger on the word so you can move back from one to the other really quickly so you don't have to look and find your place, because of course these are the children who don't read very quickly so finding their place can be very tough.

Felicity summarised:

I do think that there definitely needs to be more in the handwriting than just the physical action of it; it needs to be linked to all of the other things that they do.

Summary Theme 3: Links between handwriting and spelling

Approximately half of the teachers believed that joining letters benefited spelling although none offered a detailed explanation of the mechanism. Felicity, who had experience of teaching Year 1, felt that integrating individual sounds with sequences of movements was very important and that this was easier to achieve using cursive writing. Copying was used as a learning mechanism in Hannah's class. Some other teachers specifically trained children in copying in order to increase capacity to copy accurately or efficiently.

4.4.2.4 Theme 4: Teacher attitudes towards the national curricula for handwriting and composition

Background information

The NC for 1999-2014 (DfEE & QCA, 1999) provided statutory programmes of study and non-statutory guidance for teaching composition, handwriting and spelling. A new NC for primary schools was phased in from 2014. The draft version was available by the time that study 1 data collection took place ((DfE, 2013a). The majority of the participants commented about the new curriculum spontaneously during their interviews, including the formalization of the teaching of grammar.

There was criticism from both the media and governmental sources about the 1999-2014 curriculum for handwriting and spelling and their usage within schools:

Warning over children's 'appalling' handwriting skills. Children are struggling to write their own name because growing numbers of schools are shunning traditional handwriting lessons, academics have warned.
(Paton, 2011)

*a lack of direct teaching of spelling and handwriting
(Moving English Forward, Action to Raise Standards in English Age Group: 4–19
(Ofsted, 2012c, p.104)*

Data for Theme 4: Teacher attitudes towards the national curricula for handwriting and composition

Six of the participants introduced the current NCs for handwriting and writing into their interviews, as shown in Table 15. All comments about the current policy were adverse. Seven discussed changes in national priorities in the teaching of handwriting. Amongst the five who commented on the new curriculum, opinions were divergent.

Table 15 Theme 4: Teacher attitudes towards national curricula for handwriting and composition

(each tick indicates that a teacher commented explicitly about a sub-theme)

Schools	1	2	3	4	5	6				
Sub-themes	Teachers	Allie	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Concerns about the current NC for handwriting		✓		✓	✓	✓	✓			✓
Changes in prioritisation between higher and lower level processing in the teaching of writing		✓	✓	✓		✓	✓	✓	✓	
The new NC		✓		✓		✓	✓		✓	

Concerns about the current national curriculum for handwriting

There was considerable divergence amongst the six teachers who commented on the NC about how much central regulation there should be on handwriting tuition. Indeed Di emphasised that she would like it if there were:

as few policies as possible in the future [whether from schools or nationally]

These teachers were, however, unanimous in their opinion that the 1999-2014 NC was unclear. Even amongst those who would prefer minimal policy input, guidance on issues such as teaching frequency would have been welcome.

Allie: I won't say it would be nice as I don't like being told what to do, but I think some guidelines or expectation might encourage people to take the right level of action.

Instead of providing guidance, Allie and Chris saw national policy as driven by criticism.

Allie: 'Children should write more beautifully wha wha wha', but no actual 'this is what you should do to do it all; here are some resources in order to do it'.

Four of the participants were uneasy about the SATs handwriting marking scheme. Di commented:

"The government keeps changing terms ... Three or four years ago you could only get three marks [in Key Stage 2 SATs] if it [handwriting] was joined. Now so long as it is flowing, neat.

Esther and Felicity felt that since the maximum possible mark was 3 marks this potentially militated against sufficient time being devoted to handwriting tuition. Furthermore, like Chris, they were concerned that it is extremely difficult to be awarded 3 marks, commenting that the 2 marks band was very broad in terms of handwriting skill attainment.

Changes in prioritisation between higher- and lower-level processing in the teaching of writing

Seven participants commented on the changing priorities they have encountered as teachers of writing, their perspectives somewhat mediated by length of time since qualification. Allie compared her experience in her first post with what she encountered in initial training.

As an NQT [newly-qualified teacher], I was told at the school where I worked that how it looked mattered most out of everything, but of course at college I was told that it was important but that it wasn't the most important thing – what is in it is more important.

Allie, Chris and Gill particularly emphasised that they prioritized creativity and composition rather than lower-level skills.

Chris: I'm not overly worried about presentation standard, because in 90% of what we do in English is drafting ... our English work is more about the creativity side

The teachers who were qualified more recently had a different viewpoint. Esther and Hannah commented about the greater emphasis now placed on formal instruction in sentence structure:

Hannah: When I first came into teaching it was more about what the children are writing rather than how it looks ... Now I am focussing more on getting the correct grammar - the choice of words that they use and the sentence structure

Similarly, Bridget and Felicity pointed out that whilst quality of content had previously been the priority, children are now also expected to combine creativity with much greater knowledge of text types.

Bridget: [Writing] has become much more genre-focussed ... children are expected to know the features of different types of text and know and what features they need to include in their writing. There isn't much just 'have a go at writing this'. Children are told to write this, and they must include these things in order for that writing to be successful.

Nonetheless, Felicity questioned this approach:

The kind of interpretation and all that kind of thing that they do at quite a high level at primary school ... there is quite a lot of pressure from the government and Ofsted and head teachers that children have got to be constantly going for a higher level.

She would prefer to concentrate on transcription at primary school.

The new curriculum

There was keen interest in the new curriculum amongst more than half of the participants. Esther, Felicity and Hannah, were looking forward to teaching the new NC. They anticipated that there would be an increased emphasis on lower-level writing skills, including handwriting, and that this would be beneficial. Felicity emphasized that the aim of primary school literacy should be setting down a firm foundation in handwriting, spelling, grammar and punctuation, ready for higher-level approaches in secondary school.

Felicity: Although there is a lot of people who are objecting to it, I am pleased that there is going to be a change towards more focus on grammar, punctuation and handwriting because I think those kind of nuts and bolts of writing are so important. I think that we've moved away quite a lot from the technical aspects of handwriting, and I think it is a technical skill.

Esther and Hannah also welcomed the new NC, particularly because of greater emphasis on presentation:

Esther: What seems to be coming our way ... is more emphasis on handwriting and presentation and spelling from the new curriculum, going back to the old ways a bit.

Hannah: Now I think that people think it is important how the handwriting looks, that presentation is good, know all the vocabulary but also that they take pride in their work and presentation.

Allie was concerned that the new NC would have negative effects:

I'm very much a composition person. There are other teachers who are, who feel that transcription is of equal rating, so I think that it varies, perhaps, I think that there might be a kind of backlash.

Chris did not appear to share Allie's anxiety about the renewed emphasis on transcription. He commented that with experience teachers learn to adhere to the values which they think are important. In consequence:

you learn to be a bit cynical about policies, more than those who are more recently qualified.

Good teaching and governmental policy ... it's not that they are at loggerheads, they can co-exist side by side without really worrying too much because you just learn to play the game.

Summary Theme 4: Teacher attitudes towards the national curricula for handwriting and composition

The NC for handwriting was considered by the majority of teachers to be unclear and lacking teaching recommendations. The lack of a national handwriting style was discussed along with the variability between schools. Several teachers were concerned about the small percentage of marks allotted to handwriting in SATs marks. The participants commented on changing governmental priorities associated with teaching English and conflicts between their initial training and subsequent experience. There appeared to be a link between length of teaching career and teaching values: those qualified for longest highlighted creativity, those most recently qualified welcomed the impending emphasis on basic skills, and the remainder focussed on genre-writing. There was a corresponding swathe of opinions about the new NC. Some welcomed the greater emphasis on lower-level skills. Others favoured a more composition-focused approach to writing and were concerned that the new curriculum might have a negative impact upon children's writing.

4.4.2.5 Theme 5: Teacher ownership of school handwriting policies **Background information**

Handwriting policies in schools 1, 3 and 5 had been revised during 2011. All three policies were in documented format. The most recent handwriting policy review in school 4 had occurred during 2010 and at school 2 in 2009, and again both policies were documented. The head teacher of school 6 confirmed that there was no documented handwriting policy. The literacy coordinator assumed responsibility for handwriting in schools 2, 4 and 6.

Some of the documented school handwriting policies appeared to be supplemented by verbal elements. Evidence for this included teachers at schools in which two staff members participated giving very similar reports of elements which were not evident in the documented policies.

Data for Theme 5: Teacher ownership of school handwriting policies

All of the participants commented on the relevance of the handwriting policies at their schools to them (see Table 16). They also expressed a variety of feelings about their sense of policy ownership.

Table 16 Theme 5: Teacher ownership of school handwriting policies
(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Ally	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Teacher ownership of school handwriting policies	✓	✓	✓	✓	✓	✓	✓	✓	✓

Teacher ownership of school handwriting policies

The teachers at the schools with the most recently reviewed handwriting policies (1, 3 and 5), appeared to have strong sense of policy ownership and were well informed about policy contents. This appeared to be a consequence of the reviewing process itself. Two critical factors were collaboration and teachers being enabled to use their professional judgement with regard to handwriting. Allie, Esther and Felicity particularly highlighted the shared decision making:

Esther: We have the script that we've chosen and we've chosen very carefully how our 'z's are going to be formed and things like that, whether we are going to loop or not.

The teachers considered the new policies to be improvements on what had preceded them. Felicity welcomed the greater consistency of teaching:

I think it has been brilliant that we've had this change – that we are all doing the same handwriting style and the same expectation for everybody that every letter is formed in the same way.

The strong leadership exhibited by the head teacher at school 3 did not seem to diminish the sense of ownership.

Esther: [he] is always doing books – comes in and has a look at all the books and will make a comment if he thinks that someone needs to do something about his handwriting. But he is aware that there are improvements being made – when you see some of them, you think that's wonderful.

Esther and Hannah commented that the standard of presentation had not previously been adequate but had improved following adoption of the new school handwriting style, with the added benefits of increased speed of handwriting and greater productivity.

Hannah: It has made a difference with the start of the new cursive; I think it's much quicker ... and the presentation of handwriting has improved.

Handwriting style decisions were the most complex at School 1, a consequence of 25% of the pupils being children of international students temporarily attending a local higher education college.

Bridget: We have a lot of children who come from places like Spain and France who do have very prescribed handwriting styles, but we know that they are only with us for a year ... if they want to write in their French script or what is preferred in their own country that is fine.

Class teachers in school 3 were also able to use their professional judgement about acceptability of the handwriting styles of children in upper Key Stage 2.

The main reservations were associated with requirements for fully cursive handwriting.

Felicity: consistently joined up writing ... that's the school policy ... some letters when they are joined are illegible; I'd rather they didn't [have to] do that.

Nonetheless, Felicity conformed with the school policy.

Implicit in the handwriting policies at schools 1, 3, and 5 was the expectation that staff would use the same style which they were teaching to the children. In general, the interviewees who were learning a new style found the process to be challenging, although most enjoyed sharing the process of change with their pupils:

Esther: I'd have to say I'm not always consistent ... [in class] I get – oh no! I haven't put in the little lead we have to do!

However, Hannah found learning to use a new handwriting style rather anxiety-provoking:

I find it quite hard... I've had to make a real effort with that since we've done the new handwriting ... if you are evaluating their work you can't sort of do it badly.

Sense of policy ownership amongst the participating staff from the other schools was considerably weaker. Although Gill taught at school 4 during the time when the policy was reviewed (2010) she was comparatively less aware of it or its contents than the teachers at schools 1, 3 and 5. The school is very small (69 pupils) implying an opportunity for all teachers to be involved in the drafting of the policy:

Yes [there is a policy]. I do follow it. I think in this school handwriting is cursive from Year 1 or 2 – but things keep changing!

Izzy was equivocal when asked about school 6's handwriting policy:

It is mainly verbal ... As far as I know it doesn't have one.

She also commented:

We are told to teach them continuous cursive style ... we are told what we [should] do.

This suggested a lack of empowerment. Izzy mentioned that the policy was not always effective because there was insufficient time available for feedback:

That's the expectation, but not all of them use it all the time ... it is modelled and it is encouraged and it is expected although not all children do it.

Chris also felt that there was insufficient time for marking or feedback.

Neither Chris nor Di knew of school 2's 2009 handwriting policy although both felt that a policy might exist. Chris thought that it was a brief supplement in the English policy, "a bit tacked on". Di recalled that a handwriting policy had been drafted approximately 10 years ago which stipulated a cursive handwriting style (Nelson) agreed to by all staff. She explained that she still endeavoured to keep to the specified handwriting style although she considered that it was having increasingly little impact. Since neither Chris nor Di knew of the policy dating from 2009 they were unaware of the current school style (Teaching Reading through Spelling; Prince, Cowdery, Morse, & Low, 1992). Chris commented:

With handwriting, staff generally do whatever they were taught themselves, which is ironic ... we don't do that with any other area of the curriculum.

Summary Theme 5: School handwriting policies

Teachers at schools with handwriting policies reviewed during the current academic year were well informed about many aspects of policy contents. Participants at schools with the least recently reviewed policies had little or no awareness of the existence of the policies or their contents. The teachers at schools with newly reviewed policies appeared to have the strongest sense of policy ownership. Important factors were collaboration in the drafting of the policies and freedom to use professional judgement. The teachers at these schools adhered to the policies even if there were aspects with which they were not in full agreement, for example requirement to use fully cursive rather than largely cursive handwriting. Teachers at the other schools tended to pursue an individual approach to handwriting tuition, particularly when there was comparatively little knowledge of details of policy content. They also tended to feel a sense of disempowerment,

including lack of time within the curriculum for both teaching or marking handwriting.

4.4.2.6 Theme 6: Teaching composition

Background information

As described in Chapter 4, there is empirical evidence supporting certain techniques which have been found to be effective in teaching composition. In addition, the NC for literacy in the UK provides clear guidance on teaching and assessment (see Chapter 3). Evidence from the surveys used in Chapter 4 indicated that while effective classroom practice was frequent, not all evidence-based techniques were widely used.

Data for Theme 6: Teaching composition

As shown in table 17, most of the teachers discussed their beliefs and classroom practices about teaching composition.

Table 17 Theme 6: Teaching composition

(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Allie	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Teaching composition	✓	✓	✓		✓	✓	✓	✓	✓

Teaching composition

There was a general consensus that writing composition is a skill which needs to be taught, with modelling, clear learning objectives and encouragement.

Esther: I don't think that you can assume that children will know what's expected.

Bridget: They are more likely to have a good bash at it if they'd had a good model, if they've had that opportunity for shared writing ... If they think that what they will do will be wrong ... they are not going to want to commit their ideas to paper. So if you have that ethos of 'just have a go and write down what you can' then they are more likely to go on.

Knowledge about composition can, however, be derived from various other sources, for example from peers and reading. Bridget described using teaching partners:

Put a child who is lower achieving next to a higher achiever and that gives them something to aspire to. Get those teaching partners going within your children. Also doing shared writing ... as a whole class.

Chris: Sometimes you get very strong writers, natural ability and an interest in writing that drives the other children either directly or indirectly.

Bridget and Gill discussed the fundamental importance of reading as a foundation for generating text.

Bridget: The more they read, the more words they are exposed to, writing features which they pick up, and it acts as a really good model for good writing.

Allie, Bridget and Hannah asked their children to note down words, sentences, and paragraphs before embarking on writing tasks. Esther explained that children's individual targets are usually associated with sentence construction. Bridget and Izzy also explained 'up-levelling', for example inclusion of additional phrases, sophisticated connectives, or elaboration of punctuation. In terms of longer pieces of writing, Bridget emphasised the importance of teaching planning to improve the quality of the writing:

they need to be able to plan their writing and that's a skill that needs to be taught ... usually as a whole class or in little groups do one together on the board, getting everyone's ideas.

Four of the teachers, Bridget, Esther, Felicity and Gill, incorporated time-limited extended writing tasks in their timetables. Gill included Big Writing

(Wilson, 2012) approximately once each six weeks. As well as the task itself, Big Writing incorporates preparatory explicit instruction aimed to develop ideas, vocabulary and grammatical constructions, principally verbally but also written. Bridget's weekly timetable included 'creative literacy' in which children are given a task and an hour in which to complete it. Esther and Felicity's children undertook one-hour sustained writing tasks at least once per month. Felicity described the considerable headway made by the children as they have become accustomed to extended writing:

When we first started to do it, they couldn't do it. And now they can write pages and pages and pages ... they reach that stage towards of the end of Year 5.

She and Bridget also discussed increased opportunity for revision of text stemming from children's improved writing fluency. Felicity considered that the standard of writing in her class had become considerably higher:

They know they can do it so they can pull themselves back – they can edit it before they write it down, come back to do this later and leave it out for now. I think being able to write, being able to sustain their writing gives them time to go back and improve the quality ... In addition, they were no longer anxious about writing enough.

Some children become anxious about writing because of difficulties associated with specific subskills, for example handwriting. Lack of self-efficacy in such areas may be generalized leading to loss of self-confidence, as illustrated by Felicity and Allie:

Felicity: you couldn't read anything he had written and he was very, very embarrassed ... that he was a bad writer. When he first arrived I just said to him I'm not bothered about your handwriting at the moment; I just want to see what your writing is like ... and, taking aside the handwriting and spellings, it was at level 5a ... Because he has let go all of that stress ... he has been able to write fluently.

Summary Theme 6: Teaching composition

The teachers who participated in Study 1 considered that explicit teaching was necessary in order to enable children to compose text effectively. They

particularly emphasised teacher modelling, but also discussed other sources of information, for example peers and frequent exposure to composition through reading. The teachers' approach to their role was consistent with the not-so-simple view of writing, similar to the findings of Dockrell, et al. (2016). They included tuition in word-, sentence-, paragraph-, and discourse-level text generation, as well as planning and review, and transcription skills. Some teachers also emphasised the value of time-limited extended writing tasks as a learning tool. In addition, many participants discussed the importance of improving the self-confidence of children who experience writing difficulties.

4.4.2.7 Theme 7: Dedicated handwriting tuition

Background information

The level of detail about frequency and duration of handwriting tuition sessions in the school handwriting policies for Year 5 tuition varied between schools. This was shown in the handwriting policies themselves and was also elaborated upon by some teachers (see table 18). Only school 1 specified separate dedicated lessons and practice. There was comparatively little miss-match between timetabled provision by teachers and policies. Although there was no documented handwriting policy at School 6, the children received one 20 minute session per week. Graham and Millar (1980) recommended that the minimum amount of handwriting tuition taking place per week should be 50 minutes.

Table 18 Comparison between the handwriting policies and tuition timetabling in the participating schools

(Cells shaded grey indicated where policies and provision were inconsistent)

School handwriting policies			Timetabled provision		
Lesson	Practice		Lesson	Practice	
1	1 per week	1 per week	Ally	Less skilled hand-writers: 1 per week (25 min)	Less skilled hand-writers: 1 per week (20 min)
				No lessons for more skilled hand-writers	More skilled hand-writers 2 per week (each 20-25 min)
			Bridget	1 per week (15 min)	1 per week (15 min)
2	Stipulation that tuition would occur		Chris Di	None None	None None
3	1 per day (15 min)		Esther	None	1 per day (15 min)
			Felicity	1 per day (15 min)	None
4	'Regular' teaching sessions		Gill	1 per week (20 min)	None
5	1 per week (20 min)	Stipulation that tuition would occur	Hannah	None	1 per week (15 min)
6	1 per week (20 min)		Izzy	1 per week, simultaneous lesson and practice (20 min)	

Data for Theme 7: Dedicated handwriting tuition

As shown in table 19, all teachers discussed dedicated handwriting tuition and details of their classroom practice.

Table 19 Theme 7: Dedicated handwriting tuition

(each tick indicates that a teacher commented explicitly about a theme)

Schools	1	2	3	4	5	6			
Teachers	Ally	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Dedicated handwriting tuition	✓	✓	✓	✓	✓	✓	✓	✓	✓

Dedicated handwriting tuition

All but one of the participating teachers felt that handwriting tuition should continue throughout primary education. The exception was Di who did not consider it should be the responsibility of Year 5-6 teachers since children already had effective handwriting skills by that age. Despite the overall importance ascribed to handwriting tuition by the remainder, procedures varied considerably between classes, ranging from formal whole-class lessons focusing on accuracy (principally of letter and join formations), through to practice tasks which invariably involved copying (e.g. from the classroom whiteboard or individual worksheets).

Bridget and Gill gave whole-class handwriting lessons once per week. In each case, the principal aim was promoting accuracy of letter formation and joins.

Bridget: Very much a chalk and talk. I demonstrate how it works [i.e. modelling on the whiteboard].

There were also timetabled practice sessions for Bridget's class, focused on presentation:

could be copying a poem from the board, it could be practising a certain kind of join – try to keep it fun – copying down a joke or a riddle ... But it has to be done with presentation.

Gill concentrated on problematic letter-groupings, for example rimes. She emphasised that she did not combine handwriting and spelling tuition.

Felicity's lessons were also weekly, timetabled and whole-class but, unlike the other teachers she focused on handwriting speed. She highlighted individual interactions with children to address specific problems with pencil grip and letter-size and formation which were impacting on speed of handwriting. At this school (school 3) there were also 15 minute practice sessions every day in which children copied texts which had been displayed on a whiteboard in the school's cursive handwriting style. These were often related to personal, social and health education – PSHE.

Although school 1 stipulated one handwriting lesson and one practice session per week, Allie grouped her children because of variation in handwriting skills. She gave highly structured lessons for those who were less confident, outlining her most recent lesson:

Make an 'o' and then three 'o's and then a space – not a line of 'o's, ... then an 'o' joining to a letter ... [4 basic joins] ... and then putting that together into words, and then making maybe if we are lucky in a sentence.

Tuition for the remaining children consisted of copying practice. Children were asked to use cursive handwriting while copying text which was displayed on class whiteboard in typed print. The aim was to monitor letter joining accuracy. In addition, there was a weekly practice session for both groups of children.

Esther (also school 3) considered that all of the children in her class had sufficiently well-developed handwriting skills that whole-class lessons were inappropriate.

There is no point in me standing there and handwriting because they should be writing more than that [typically 2-3 paragraphs in each 15 minutes session].

Esther commented that children found it difficult to copy, and an important target of handwriting practice was the accurate copying of spellings in context. While Hannah also incorporated spelling into handwriting practice, this took the form of copying weekly spelling lists:

They write their spellings in their handwriting book and I ... go round and pick up anyone that's not doing it [handwriting] correctly; rather than me modelling on the board, I model with individual children.

Chris described himself as giving whole-class lessons “*once in a blue moon*” in the current academic year, although they had been essential for some previous classes. Nonetheless he, and also Hannah, timetabled additional daily supervised practice sessions for groups of children with handwriting problems. In both cases the primary activities were copying with modelling as necessary by the individual supervising the session.

Hannah focused on letter formation accuracy.

Hannah: I've got six children who have packs so they can copy the letters and practice – those children who need a little more ... than the others. They will get their pack out and work independently with that... as a morning task, and a person checks and supports them.

Chris's children practiced using tracing and there was also guidance using directional arrows. Unlike Hannah, he was more concerned with writing fluency and legibility than accuracy.

It's just not all handwriting – line tracing and that sort of thing ... one small part of an overall assault on the standard of their presentation with regard to the speed they get stuff down and the legibility of presentation.

Izzy's class was taught handwriting by a separate teacher in one 20-minute session per week. The children were divided into several small groups. The groups rotated, one receiving a lesson per session whilst the others practised. Both Izzy and Chris regretted that there was insufficient time to include more handwriting tuition in the timetable.

There was a general consensus that across the curriculum little copying took place. For example:

Izzy: We don't do a lot of copying or taking notes particularly. The only thing they do is to copy the learning objective off the board.

Summary Theme 7: Dedicated handwriting tuition

All but one of the teachers considered that children should receive dedicated handwriting tuition throughout primary school. Teaching was either whole-class or in groups. For most the principal method was modelling on the whiteboard aimed at teaching or reinforcing accuracy, particularly of letter joins. One teacher emphasised handwriting speed. Two teachers explained that the tuition they gave was in the form of practice because the children already had established handwriting-skills and practice was for them more appropriate. Practice invariably involved copying, either from the white board or individually. The purpose ranged from enhancing presentation skills to promotion of copying accuracy (either connected text or spelling lists). Timetabled additional support was supervised by a staff member who provided modelling as required. It involved children practising at their own speeds, largely engaged in individual copying exercises but also tracing.

4.4.2.8 Theme 8: Checklists and feedback

Background information

There was little governmental guidance on feedback to pupils available to teachers up till the time that the data for study 1 was collected. In a report commissioned by the DfEE (McBer, 2000), teachers who were effective were considered to: “*encourage pupils to judge the success of their own work*” (p. 16) and “*give individualised feedback, get pupils thinking and making breakthroughs in their understanding*” (p. 59). More guidance was published in 2011, for example in ‘The Toolkit of Strategies to Improve Learning’ (Higgins, Kokotsaki, & Coe, 2011) a series of meta-analyses including on feedback, ‘Making Marking Matter’ (Ofsted, 2011), and in

‘Teachers' Standards’ (DfE, 2011b). Topping (2010) noted that there was very little evidence on peer-feedback at primary school and Black and Wiliam (1998) highlighted the necessity for children to understand targets if self-evaluation and peer-feedback were to be effective.

Data for Theme 8: Checklists and feedback

Teachers whose children had well-developed handwriting skills were less likely to give feedback on handwriting than those who taught children whose handwriting skills were less secure. A second factor was the perceived relative importance of transcription and higher-level writing skills; Chris saw handwriting as a tool for communication and feedback was directed towards it only if it was illegible. Table 20 shows the sub-themes which were developed from participant responses.

Table 20 Theme 8: Checklists and feedback

(each tick indicates that a teacher commented explicitly about a sub-theme)

Schools	1	2	3	4	5	6				
Sub-themes	Teachers	Allie	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Checklists		✓	✓	✓		✓		✓	✓	
Self-evaluation and peer-feedback			✓	✓	✓	✓	✓	✓	✓	✓
Optimization of the value of teacher feedback		✓	✓	✓	✓	✓	✓	✓	✓	✓

Checklists

Checklists were widely used during planning, execution and revision of written work, and in self- and peer-feedback. Allie provided an example:

remember to use exciting words, vary the length of my sentences, have thought very hard about the spelling of my words.

The checklists may comprise specific literary targets for individual children, as outlined by Bridget, Esther and Gill. Esther explained that in her class they frequently involved grammar. The checklists might be levelled.

Bridget: He is a particularly good writer, this is a level 5 target card, so he can self-assess, making sure that he's got all this to make sure that he can become a level five.

There might also be class-level reminders on the walls, changing from day to day.

Allie, Bridget and Chris explained that checklists frequently reflected the a strong focus on genres in upper Key Stage 2.

Bridget: Usually each week we have a focus ... Last week we looked at explanation texts. So we start off a unit of work by looking at a big sample, and picking out those key features so that you have a checklist ... We want the children to know that it's got to include X, Y, Z; if they are writing an account, these are the really useful features to put into it..... they have to think how they can apply that to their own writing.

As in other classes, the outcome was that Bridget's pupils were given pre-printed checklists including approximately six items related to specific text types. Bridget emphasised the necessity for this specificity:

If you didn't have this, girls in particular would revert back to a story in some way, because that's what they are most familiar with. They are not familiar with writing newspaper reports ... but everyone reads stories. Unless you teach this, it doesn't come naturally.

Chris summarised the writing process:

Our English work is about trying to apply things they have learned, like writing styles or features of writing.

Self-evaluation and peer-feedback

Attitudes to peer-feedback and self-evaluation varied between teachers, principally because of concerns about whether the feedback was objective. For these reasons, neither Gill nor Izzy felt that peer-feedback or self-evaluation were appropriate.

Gill: There is no peer or self-evaluation – I like writing to be supervised.

Di was concerned about the quality of feedback:

must know what they are doing, tightly controlled – must be able to judge criteria for success.

She explained that any self-evaluation by children was always carried out via discussion with her. Similarly Felicity commented on the risk that the feedback might include advice that was either inappropriate or wrong.

Self-evaluation and peer-feedback was felt to be most effective when checklists or lists of criteria were used.

Bridget: It is a skill that needs to be taught, and quite often we'll use a piece of volunteered work and we'll look at it as a class; what can we find that is good and what can we find that needs to be improved on. But they still need to be taught.

Bridget continued by explaining:

I always ask them to read through their written work and then self-assess it, and they've got their own highlighters.

Esther incorporated peer-feedback into her teaching. It was generally directed toward content although sometimes a presentation criterion was included.

generally speaking, the success criteria or the check list they use to do the writing is what they use to assess the writing themselves.

Hannah explained that she was trying to train her children in peer-feedback focussing specifically on the learning objectives:

but you still do get the children who comment on the handwriting. And they are very good at putting it nicely ... perhaps you could add this next time ... They enjoy doing it.

Bridget explained that pupils either read work aloud to each other or swapped their books. Following this they awarded 'two stars and a wish':

Two stars is if they find things that they really like, and a wish is something which they wish that there was a bit more of ... Sometimes they might draw two little stickmen if they've done it together, and they discuss this.

A different approach was adopted by Chris who used peer-feedback as a more general learning tool:

They have learning partners ... their first port of call, to go to them. It also helps to encourage this idea that we are all good at different things. So they don't just go to their friends; they perceive someone who is good and go to them. It is PHSE stuff, food for self-esteem, and that they could all help one another.

Chris saw this procedure as more effectiveness than teacher feedback:

if is someone they've chosen, it's a person they will trust. 'I can't read this' means more to them than the teacher saying something ... 'does that look neat enough for you' and they'll say yes ... or they'll say no because they think that's what you want them to say.

Optimization of the value of teacher feedback

The majority of teachers mentioned using Assessing Pupils' Progress (APP) in their teaching of writing. Several explicitly levelled work in written feedback to children, generally on the basis of individual APP foci. Some schools had written feedback policies, for example highlighting systems (positive: party pink; corrective: green for growth). Bridget explained how this system was used:

Every lesson we have a learning objective ... if there are examples which show that they have met that learning objective, as listed on the children's checklists, I will comment on them in pink.

Chris commented that 'children do not read written feedback' but he also observed that written feedback also provided evidence that marking had taken place.

Amongst participating teachers, there appeared to be a preference for giving verbal feedback, principally because it was more meaningful to children.

Chris: Far more relevant to the child if the teacher says 'It's brilliant ... Why do you think I like it or what is it about it, or you've really worked hard at this' than it is just to comment in the book or not really comment.

Six of the nine teachers commented on the importance of praise, Esther observing that "being noticed is more than anything." An important

element of the praise appeared to be boosting self-esteem. Esther and Felicity emphasised the importance of positive verbal feedback for children with handwriting difficulties. Praise in class was generally one-to-one, but Felicity sometime also addressed it to the whole class as a means of motivating other children.

Five of the nine teachers said that the corrective feedback they gave was always verbal rather than written. This provided them with teaching opportunities:

Esther: I've seen what you have written before and it's been beautiful, but what's happened here? Did you find this difficult? Did you think about something else? Did you rush?

Chris tried to explain his reasoning to children, for example when handwriting is very small:

I understand what you are doing here is, you are trying out different styles out and that's fine, but from my point could you read that or not, or could someone else read that.

Felicity felt that comments such as: “you are doing that wrongly, you are doing that wrongly”, were destructive because of effects on self-esteem. To counter this, she tried to use the word ‘we’ to imply a collaborative approach:

do we need to do something about it, or can you think of what to do about it, or do you need me to show you another way of doing it?

Opinion on the relative time-efficiencies of verbal and written feedback varied. Chris estimated that he could say in two or three minutes what it might take him five minutes to write. Hannah explained that her current class was sufficiently small (24 children) to enable her to give verbal feedback to all of her pupils. However, in the following year she was expecting a larger class making reliance on verbal feedback impractical, necessitating a shift towards written feedback. Di sometimes used shared whole-class feedback.

Summary Theme 8: Checklists and feedback

Most of the participating teachers combined peer-feedback, self-evaluation and teacher-feedback. Teacher attitudes to the competence of children to self-evaluate or provide peer-feedback on handwriting ranged from positive through to it being inappropriate or problematic. Those who promoted peer-feedback and self-evaluation considered that it needed to be taught and was most effective when the children used pre-determined criteria.

Teacher feedback fulfilled several different functions, principally brief one-to-one teaching sessions, recording whether learning objectives had been met, and boosting self-esteem. Verbal feedback appeared to be viewed as more effective. Praise was felt to be particularly beneficial to children who found handwriting difficult.

4.4.2.9 Theme 9: Handwriting and confidence

Background information

Handwriting was initially conceptualized as an amalgam of motor and sensori-perceptual elements. Two further characteristics have been incorporated into theories of handwriting – cognitive and, more recently, linguistic. However, data deriving from the interviews highlighted a further facet which combined self-esteem and motivation. Whilst motivation occurs in some models of writing it is not linked with transcription, and self-esteem is not considered.

Data for Theme 9: Handwriting and confidence

As shown in table 21, all of the participants considered that ability to handwrite accurately was associated with self-esteem, motivation and maturity.

Table 21 Theme 9: Handwriting and confidence

(each tick indicates that a teacher commented explicitly about the theme)

Schools	1	2	3	4	5	6			
Teachers	Allie	Bridget	Chris	Di	Esther	Felicity	Gill	Hannah	Izzy
Self-esteem, motivation and maturity	✓	✓	✓	✓	✓	✓	✓	✓	✓

Self-esteem, motivation and maturity

Well-established handwriting skills were widely considered to have a positive effect on self-esteem. Bridget, Esther and Hannah laid particular emphasis on high standards of presentation, using strikingly similar phraseology:

Bridget: I think you want your work and your writing to look nice. You want it well-presented – you should want it well-presented. I think it helps self-esteem. They look at what they’ve done and it looks good.

Esther and Hannah continued by linking the effects of well-presented work with the phrase “*pride in work*”. They considered that there is a positive association between ‘pride in work’ and motivation to write. Gill considered the effects of handwriting on a more general front:

Handwriting is important – it affects the way you are judged so you are taken seriously.

The view taken by Esther was even more all-encompassing. She explained that many of her pupils felt that handwriting reflected personality:

We [she and her pupils] recognize it’s important because, you know that you can look at someone’s writing and say a lot about them.

Status could be gained through achievement of well-established handwriting skill. Four of the school policies permitted personalisation of style for

children whose handwriting was dependably accurate and neat, and Allie, Bridget, Esther and Felicity described it as beneficial because the style was 'their own', 'comfortable', 'personal' and indicated maturity.

Felicity: They need to be using and adapting handwriting to suit their own needs, develop an individual style.

Felicity also prioritized assisting older children to adopt a style which was physically comfortable. Permission to use pens rather than pencils was also dependent on handwriting skill.

Not all teachers viewed personalisation as positively. Chris and Di saw it as inevitable but acceptable providing it did not compromise legibility and handwriting speed. Hannah and Izzy discouraged personalisation, although Hannah's school permitted it for children with well-established handwriting skills.

Handwriting difficulties were linked with low self-esteem. Allie, Chris, Esther, Felicity and Hannah described difficulties associated with coordination and discomfort faced by some children:

Hannah: You can see that there is a couple whose fine motor skills are poor so it is just physically hard. I don't know whether it is because they are reluctant writers or because they struggle to write – which way round it is.

Felicity described the effects of handwriting difficulties on the self-esteem of a pupil newly arrived in her class:

maybe he was really bad at handwriting but that had been his only feedback in terms of literacy.

Allie explained that her particular concern was those children whose writing development is held back by their handwriting development:

Is it an attitude link? Is it a self-confidence link?

Attitude towards handwriting was considered by Di to be important even amongst those who have acceptable handwriting:

They know. Whether they do it is another thing.

Summary Theme 9: Handwriting and confidence

The participating teachers placed considerable emphasis on the links between handwriting and self-esteem, motivation and maturity. The positive effect of well-presented handwriting was described by several teachers. Lack of self-esteem was associated with an underlying chain initiating with poor motor coordination, which then continued via factors such as shame and the effects of feedback on writing tasks which had focused on handwriting rather than content. The ultimate consequence was a reduction in self-efficacy as writers. The teachers also spoke about reluctance to write and poor motivation. Several reasons for reluctance to write were suggested, ranging from low self-confidence to detrimental attitudes and perceived high personal costs of writing.

4.5 Discussion

Data from the study 1 interviews offered a rich insight into teachers' theoretical understanding of handwriting and the extent of their knowledge of and attitudes towards school handwriting policies. In addition, there was an abundance of evidence about classroom practice in handwriting lessons. The responses were considered in terms of writing tuition as a whole. Nine themes were developed in the interview analysis, and the findings are discussed in terms of the original research questions into teacher beliefs, policies and training, and operationalization of pedagogy.

4.5.1 Handwriting and writing skill development

Most participants felt that the experience of teaching children across a range of school years had given them valuable insight into handwriting development. Some also commented that they had also gained knowledge from school handwriting policies although a few teachers considered that imposed attainment targets by year were inappropriate due to developmental differences. Instead they were more concerned with encouragement of

children whom the participating teachers felt had handwriting difficulties associated with poor coordination.

There was frequent evidence in the interviews that many of the teachers were aware of the potential for cognitive overload when children are acquiring writing skills, and the resultant effects on compositional quality, spelling and handwriting speed and neatness (consistent with the effects of limited working memory availability). The participants particularly emphasised increased cognitive load associated with requirements for change in handwriting style. Examples include the transition to cursive handwriting, changes in school handwriting styles, and moving between schools or countries with different handwriting styles. Transitioning between non-joined to cursive handwriting and changes in school handwriting style were directly associated by participants with reduction in compositional quality, consistent with Van Galen's (1991) description of the effects of cognitive overload. In addition, consistency of style was considered to be important and lack of a national UK handwriting style was discussed along with potential variability between schools or even classes within a single school. Teachers at the schools with recently reviewed handwriting policies referred to the benefits of greater consistency. This included teachers using the school style in all communication with children.

The transition to cursive writing was, however, seen to be worthwhile because of concomitant benefits. These included increases in speed, neatness, and spelling accuracy. Out of the teachers who taught Year 5 or Year 5/6 classes all but one considered that fully cursive handwriting was faster than semi-cursive or non-joined. Studies such as Bara and Morin (2013) have, however, reported that semi-cursive handwriting is faster. There was also a widespread belief (expressed by four teachers and included in half of the school handwriting policies) that moving to cursive handwriting benefits spelling. There is in fact very little evidence about the relative effectiveness of cursive or non-cursive writing in enhancing spelling accuracy although Alstad et al. (2015) concluded that this might be the case.

A different participant emphasised that integrating individual sounds with sequences of movements, as in phonics, was highly beneficial to spelling and that cursive writing was a more effective tool in developing spelling skills.

Many of the participants emphasised the importance of practice, consistent with Guardagnoli and Lee (2004) and others. The principal goal for handwriting practice appeared to be greater accuracy of letter formation and joins in order to facilitate presentation, rather than directly increasing speed. Handwriting and spelling practice were in some cases combined, for example multiple copying was used as a learning mechanism in spelling, and teachers scrutinized the copied spellings for handwriting errors. Santangelo and Graham (2016) found that for Grades Kindergarten to 3 (5-9 years) copying with or without writing from memory had positive effects on handwriting legibility, but Berninger et al.(1997), found that visual cues combined with memory were more effective than copying. In terms of spelling, copying five times and self-correction were compared by McGuffin et al. (1997) and they showed that self-correction was more effective than copying. Copying skills were themselves also targeted by some of the participants in Study 1 since they considered that there would be a considerable requirement for copying in secondary school.

The majority of the participating teachers believed that presentation skills were linked with motivation and self-esteem. Not only did they consider the presentation effect (enhancement of grading because of legibility of handwriting), one participant considered that presentation had social ramifications since it may enhance perceptions of maturity, and another felt that handwriting signified personality. Dazzi and Pedrabissi (2009) found no evidence of such a link. Overall, children were felt to be rewarded by their achievements in terms of presentation, and the consequence was enhanced motivation and reduction in anxiety.

There was a corresponding conception of lowering of self-esteem amongst those with handwriting difficulties. Problems, seen largely as originating in

poor fine motor coordination, were felt to precipitate cognitive overload when children are required to cope with both higher- and lower-level writing processing demands simultaneously. This effect was considered to be bolstered by feedback which emphasised handwriting difficulties rather than compositional quality. The results were low writing self-efficacy and poor motivation.

4.5.2 Extent to which handwriting skills are related to quality of composition

Seven of the nine participants considered that handwriting speed is a better predictor of compositional quality than neatness, providing the handwriting is legible. Some referred to the necessity for sufficient speed of writing in handwriting for SATs in terms of sufficient words on the page to convey information. Only one described the beneficial effects of automatization on quality of composition. Several teachers commented that speed of handwriting was a product of capability to process complex cognitions.

Despite this, most of the teachers indicated that neither they nor their schools prioritized handwriting speed and, in some cases, focussed instead on presentation. None of the teachers were certain whether the word ‘speed’ was mentioned in their schools’ handwriting policy. One reason may be confusion with the term ‘fluency’. Fluency was highlighted in the NC, occurred in all of the documented handwriting policies and was considered a priority in handwriting by five of the participants.

Nonetheless, the relationship between fluency and speed appeared to be indistinct. One participant saw speed as a consequence of fluency whereas another saw fluency as an outcome of accuracy and speed. This contrasted with several of the others who appeared to consider fluency more in terms of accuracy of letter formation and associated it with the benefits of cursive handwriting in learning spellings.

Only three participants expressed consistent opinions about the relationships between handwriting speed, neatness and compositional quality throughout their interviews. In contrast, there was ample evidence of cognitive dissonance amongst others, based on conflicting beliefs about the role of handwriting speed as a predictor of quality versus importance of presentation. This may be a product of the emphasis placed on presentation as a source of higher self-esteem and greater motivation by a proportion of the teachers, and some referred to the sacrifice in neatness if speed is increased. Some appeared unconscious of their inconsistent views. Only one teacher was able to verbalise her dissonance lucidly.

4.5.3 Active promotion of handwriting speed

Apart from one participant, it appeared that direct promotion of handwriting speed by teachers was not seen as necessary since speed is a consequence of accuracy. For children approaching automaticity this is likely not to be the case. There is an upper pen-tip movement speed which can be monitored using feedback control (Schenk et al., 2000; Schmidt, 1975) and more rapid, feedforward-controlled handwriting using previously laid down motor programmes may result in letter shapes which are not consistent with school handwriting styles (Danna, Enderli, Athènes, & Zanone, 2012), i.e. are less accurate.

Consistent with the NC and all school handwriting policies, each participant taught cursive handwriting and expected the children to use it. Increasing accuracy of joins between letters was seen as a means of promoting handwriting speed. Six of the seven Year 5 and Year 5-6 teachers believed that fully cursive handwriting was faster than partly cursive or non-cursive writing although this does not reflect the research findings of Bara and Morin (2013) or Graham, Weintraub, and Berninger (1998).

According to Graham, Berninger, and Weintraub, et al. (1998), personalisation of handwriting promotes handwriting speed. Most of the

participating school policies and teachers encouraged or tolerated personalisation, unlike the NC operational at that time. Personalisation was not considered to enhance handwriting speed but encouraged because it decreased discomfort, implied greater maturity, and made the handwriting ‘their own’.

The teacher who did actively promote handwriting speed in lessons was motivated by her role as a teacher of children shortly to transfer to secondary school. She explained that she found it very challenging and demoralising because she was not always successful. Three other teachers expressed an interest in promoting speed. This they achieved through monitoring how much had been written, rather than actively promoting handwriting speed in dedicated tuition sessions. A different viewpoint was taken by one participant who felt considerable conflict between the requirement for children to take time-limited SATs and his personal beliefs about optimum creative writing environments.

4.5.4 Associations between handwriting and spelling skills

Four of the teachers were confident that a link between handwriting and spelling skills has been demonstrated (“its been proven”). They attributed the link to the greater ‘flow’ or ‘fluidity’ in writing, and felt it was particularly important for children with coordination difficulties. As yet, there is comparatively little evidence that such a link exists (although see Afonso et al., 2018; Alstad et al., 2015; I. M. Bosga-Stork, Bosga, & Meulenbroek, 2011). One of the teachers also embedded the link in phoneme/grapheme correspondences (as in synthetic phonics) since this allows for understanding digraphs through “the association between the sound and the shape”. Other teachers were equally convinced that spelling and handwriting should not be taught together although this was to some extent due to practical considerations since there is sometimes quite a divergence between spelling and handwriting capability.

A few teachers linked spelling and handwriting through capacity to copy spellings accurately. This was considered important because it was felt that copying was important in secondary education.

4.5.5 Impact of school policies and the NC for writing on classroom practice

The impact of school handwriting policies on the participants appeared strongly to reflect how recently they had been reviewed or written. Three of the schools, in which five participants were staff members, had reviewed their policies during the current or immediately previous academic year and in each case there was a defined school handwriting policy used by every staff member in all of their interactions with the children. All of these participants were well informed about the contents of the policies.

The teachers at these schools seemed to have a high sense of ownership of the newly reviewed policies. One reason was collaboration in choice of handwriting style. A second was freedom to use professional judgement about the handwriting styles of new pupils whose handwriting style was already well established. Some of the teachers described instances in which they followed a new policy even when not in complete agreement with it, for example asking children to use fully rather than largely cursive handwriting even though fully cursive writing might be less legible.

Unlike the teachers at the schools with the most recently reviewed policies, the remaining participants had considerably less knowledge of the content of their schools' policies or even of their existence. There appeared also to be an element of disempowerment, for example being 'told' what to teach rather than having been involved in school style decision making. In these cases most of the teachers taught handwriting in a style of their own choosing, which did not necessarily use the same letter forms or joins as other staff members at the school. An observation made by one of this group of participants was that whereas teaching in other subjects had

evolved over time, individuals tended to teach the same handwriting style that they had themselves learned as children, with potentiating style changes each time a child moved from one teacher to the next. This accorded with comments by teachers at schools which had adopted a consistent handwriting style throughout the school, which they felt was highly beneficial. Consistency of style reduces cognitive demand and has been recommended by the National Handwriting Association (Tibertius, n.d.) and DfEE (2001).

Seven of the participants discussed the NC but none endorsed it since it was considered to be vague and lacking in teaching guidance. In addition some teachers felt that it impacted negatively on handwriting tuition in schools because of the considerable emphasis placed on higher-level processing in writing, which reduced the time allotted to handwriting. This is contrary to the findings of Cutler and Graham (2008), Dockrell et al. (2016), and Graham et al. (2003) who found that teaching time devoted to lower-level writing skills was greater than that for higher-level elements such as planning and review. There was also concern that SATs marking impacted on teaching, the small number of marks for handwriting (3/50) being another impetus for reduction in time allotted to handwriting in school curricula.

There were other concerns about the NC and associated testing. One teacher felt that the process of assessment conflicted with his professional beliefs about learning of writing skills. He considered that time-limited tests, for example SATs, impacted on compositional quality, and also that teachers were uncomfortable about 'teaching to the test'. His feelings reflected Ball's (2003) arguments against 'performativity', a system of regulation based on comparison, competitiveness and judgement which has been increasingly applied in the education system since the Education Reform Act of 1988. Performativity replaced a structure based on the professional judgement of teachers. This change has been a source of inner

conflict because it led to some teachers feeling that their role had been devalued.

The participants commented on changing governmental priorities associated with teaching English, as reflected in the new NC for literacy. There appeared to be a link between length of teaching career and teaching values: those qualified for longest highlighted creativity, those most recently qualified welcomed an emphasis on basic skills, and those between focussed on genre-writing skills. This range was reflected in responses to the new curriculum. More recently qualified teachers hoped that the new NC would raise the status of handwriting, although there was in fact minimal change in the handwriting specifications. Those who gave a greater priority to higher-level writing skills were concerned that greater emphasis on transcription would negatively impact on creativity.

4.5.6 Adequacy of training in teaching handwriting

Several of the teachers reported that they had received no instruction in handwriting tuition during pre-service training. Nonetheless, more than half felt they had received adequate or more than adequate training either pre-service or subsequently (although none mentioned INSET). One commented that priorities in her initial training differed markedly from the school she subsequently worked in as an NQT. At college, while handwriting was of importance, compositional content was more significant. In contrast, in her first teaching post it was made clear to her that presentation was paramount.

Several of the teachers felt that they had become more informed when handwriting policy reviews or monitoring were taking place. An important aspect was group research, discussion and decision-making about changes to school handwriting styles. One participant had undertaken online research in order to design a scheme to provide support for reluctant writers. Handwriting coordinators were rarely referred to but there was particularly

strong leadership on handwriting tuition provided by a head teacher, which seemed welcomed by the two Year 5 teachers at his school.

Only two participants felt that they had received sufficient training in promotion of handwriting speed. Neither actively promoted speed, one focussing instead on composition and the other on presentation skills. The teacher who placed the highest priority on handwriting speed often attempted to promote it in her handwriting lessons, but felt demoralised since she did not feel competent. One interviewee asked where she could find out about promotion of handwriting speed as she had not previously considered it.

4.5.7 Amount of dedicated handwriting tuition given

All teachers felt that handwriting (and spelling and composition) should be taught explicitly at primary school. In their meta-analysis of studies covering Grades 1-9 (6-15 years), Santangelo and Graham (2016) identified significant positive effects of explicit teaching of handwriting on both handwriting legibility and fluency, and also on the length, fluency and quality of compositions. Seven teachers felt that there should be handwriting tuition till the end of Key Stage 2 and the importance of practice was emphasised by the majority.

The handwriting policies at all of the schools implied that there should be regular handwriting tuition including in upper Key Stage 2. There was, however, little detail relating to the frequency and duration of the sessions. In most cases this appeared to be welcomed by the teachers since it allowed them to exercise their professional judgement with regard to the type of tuition given. Amount of whole-class tuition given exceeded the time recommended by Graham and Millar (1980) in only one school, in which children had 15 minute sessions every day. Another teacher approached this level, as did the children receiving daily additional support at two of the schools. In all other cases the amount of tuition ranged from 15-30 minutes,

and in all cases but one this was once-weekly. This did not reflect Graham and Hebert's (2011) recommendation that sessions should be frequent and short.

The type of session given was in many cases determined by the handwriting skill levels of the children in the classes. One teacher combined a lesson for those whose skills were less well established with practice for children whose letters and joins were accurately formed. Another confined tuition to practice because she considered that her children's accuracy was sufficient that copying practice was more appropriate. She felt that this was important since secondary school pupils are frequently required to copy information and commented that children find copying accurately difficult. The rationale behind the tasks for children with better developed handwriting skills was different. In the first instance children copied text written in a standard font and translated it into the school style which was joined i.e. continuing evaluation of knowledge. In the second, children copied text written in the school style – reinforcement by overlearning. There is no relevant research information.

Whilst practice emphasised presentation, lessons primarily addressed accuracy. Whole-class teaching predominantly involved modelling joins between letters on the whiteboard, with individual modelling as required. Santangelo and Graham's (2016) meta-analysis included studies on modelling for children in Grades 1-3 (6-9 years) and found it to have a positive effect on legibility. Modelling, involving teacher verbalisation was described as an effective form of tuition by Berninger et al. (2006) and D. Hayes (1982).

Provision of support for children with handwriting difficulties varied between classes. In most cases it involved additional individual assistance within class. However, two teachers timetabled daily supervised practice for approximately one quarter of the children in their classes. In one case the targets were increasing the amount written and consistency of letter size. In the other, support was aimed primarily at letter formation problems.

Santangelo and Graham (2016) identified that interventions lasting for at least 10 hours were more effective than those which were shorter, and Hoy et al. (2011) emphasised that there should be more than one session per week. The two teachers were meeting these criteria. However, tuition in additional support sessions included activities such as tracing, which was found by Overvelde and Hulstijn (2011) to be ineffective.

One teacher systematically used blocked followed by random practice in handwriting lessons (see Ste-Marie et al., 2004). A target letter was incorporated into short strings, following which the four types of joins between letters were practiced. The letters were then included in words and sentences. Very little research has been carried out on structured practice of handwriting skills. Ste-Marie et al implied that even children as young as 6 years benefited more from random practice rather than blocked, but the results were inconclusive.

It was demonstrated in several of the surveys in Chapter 3 that many children rarely wrote more than one paragraph at a time. However, four of the teachers participating in this study provided regular whole-class extended writing opportunities, largely directed at SATs and secondary school writing requirements. Not only does this have the potential to increase handwriting speed since the additional practice is likely to increase automaticity, the teachers also valued the confidence gained by the children.

In terms of compositional skills, the participants believed that teacher modelling was effective, although other sources of information, for example high-performing peers and reading, were also considered to be valuable. As Dockrell, et al. (2016) found, the approach of the participants in Study 1 was consistent with the not-so-simple view of writing (Berninger & Winn, 2006) and the NC. This encompassed tuition at word-level (principally vocabulary), sentence-level (grammar), and paragraph- and discourse-levels (text structure and planning). However, teaching associated with reviewing appeared to be infrequent although Graham and Santangelo (2014)

identified that explicit instruction of executive functions had the greatest effect size amongst the studies included in their meta-analysis.

4.5.8 Monitoring and evaluating handwriting and writing

Definitions of the terms ‘monitoring’ and ‘evaluating’ were to some extent inconsistent, with some teachers using the terms synonymously. All teachers used optional SATs and one used the handwriting results to identify those who would be given additional support in handwriting the following year. One school had termly moderation which included all exercise books for every child. Two teachers gave informal one-to-one tests at the beginning of academic years in order to identify children with handwriting difficulties and draw up individual goals. None of the teachers used standardized assessments. For most children, the only oversight through the year was from day-to-day informal monitoring by teachers. This diversity reflected Barnett et al.’s (2006) findings.

Approximately half of the teachers gave a weekly spelling list to children to prepare for a test. There was no evidence of testing of lexical richness or curriculum-based measures. Several teachers marked genre-based tasks using overall levelling and detailed comments for example identifying a ‘level 5 connective’, or ‘level 3 comma’; Graham and Santangelo (2014) meta-analysis identified that teacher assessment of compositional quality was one of the most effective methods of promoting compositional quality

4.5.9 Feedback procedures

There was considerable variation between schools in the amount of feedback given and its format. Peer-feedback and self-evaluation were widely reported by the participants but a major concern was training children to use them effectively. The participating teachers suggested that there was a tendency for peers to comment on transcription skills rather than higher-level processing. Topping (2010) found that there was a lack of

evidence concerning the efficacy of primary school peer-feedback. McBer (2000), while recommending that children should self-evaluate, did not provide guidance about how this should take place. Black and Wiliam (1998) emphasised that it is essential for pupils to have clearly-understood targets and several of the participants pointed out that self-evaluation and peer-feedback were most successful if children were given targets/checklists, reflecting Graham, McKeown, Kiuvara, and Harris's (2012) conclusions. Santangelo and Graham (2016) found that self-evaluation positively effected handwriting legibility for children in Grades 4-8 (9-14 years). Similarly, Graham et al. identified that peer-assessment and self-evaluation were effective

Written feedback from teachers typically involved error-identification and recording whether learning objectives had been met. Ofsted (2011) highlighted the positive effects of highlighting using colour coding for positive and negative feedback. This system was used by several of the participating teachers.

Verbal feedback frequently took the form of brief 1:1 teaching sessions (typically involving modelling). For feedback which did not involve modelling some teachers indicated that this involved co-construction of knowledge, consistent with McBer (2000) who indicated that effective teachers promoted pupil metacognitive thinking skills. Apart from teachers who used colour coded marking, corrective feedback was invariably verbal. Some teachers rarely gave feedback on handwriting since there were more urgent priorities related to higher-level processing. However, several participating teachers felt that an important function of verbal-feedback was boosting self-esteem.

There was widespread use of praise. Praise was generally one-to-one. One teacher congratulated pupils publicly in the classroom in order to promote motivation although the meta-analysis of Burnett (2001) noted that two thirds of pupils preferred it if praise was private. Deci, Koestner, & Ryan (1999) conducted a meta-analysis on studies of the effects of extrinsic

rewards on intrinsic motivation and found that tangible rewards had a negative effect on children's motivation, and the positive effects of verbal rewards were insignificant.

4.5.10 Limitations

Since the purpose of this study was to gain detailed insight into the experience of teaching writing, an interview format comprising open questions, appeared appropriate. However, initiating with a focus group of different teachers would have helped to guide the selection and wording of interview questions. Also, any potential generalizability from the findings of this study was impacted upon by the sampling procedure, since the participating schools were deliberately homogeneous to take account of the limited size of this project. Furthermore, all of the schools were in rural Oxfordshire and the teachers may not be representative of primary school teachers as a whole.

4.6 Key points and conclusions

The findings of the current study indicated that teachers were aware of and concerned about the cognitive overload which some children experience when writing, deriving from the combined demands of transcription, text generation, and executive functioning. Nonetheless, many were unclear about the relative importance of handwriting speed and neatness/presentation in relation to compositional quality, and their beliefs and classroom practice in this respect were sometimes at variance.

The amount of handwriting tuition and its purposes varied widely across the teachers. In general the emphasis was on accuracy with only one teacher actively promoting speed in handwriting lessons. Several teachers believed that there was clear research evidence linking use of joined handwriting with spelling accuracy despite this not being the case. Since the NC

requires that for at least younger children handwriting and spelling tuition should be linked, there is a requirement for more research in this area.

The participants considered that the NC for handwriting was vague and lacked guidance for teachers. In this context, school handwriting policies are of particular importance. There appeared to be a positive relationship between teachers' knowledge of school handwriting policies and attitudes towards them and how recently the policies had been reviewed. This in part seemed to be a consequence of a sense of ownership deriving from teachers participating in the review process themselves.

Views about the relative importance of transcription and composition differed between participants and opinions were divided about the benefits of greater emphasis laid on transcription and grammar in the new NC curriculum. It did appear that there was an association between length of teaching career and these opinions, with participants more recently qualified regarding the new NC more positively.

Most teachers participating in Study 1 discussed the importance of classroom procedures typical of explicit teaching, especially modelling by teachers. As in Dockrell et al. (2016), the participants in Study 1 gave writing tuition consistent with of the not-so-simple view of writing (Berninger & Winn, 2006), along with other statutory elements in the NC which are not included, for example punctuation. In addition, some emphasised the importance of extended writing tasks. Many teachers felt that children's motivation for writing was strongly positively associated with their transcription ability.

Study 1 explored teachers' experience of writing tuition and was intended to provide an environment for studies 2-6. Study 2 described and categorised the entire of gamut of written work carried by the pupils of the study 1 participants. The allocation of work into definable categories enabled use of the data in studies 3-6. It also enabled comparison between teachers' beliefs with actual practice.

5 METHOD, STUDIES 2-7

This chapter describes methodology common to studies 2-7. Additional details for individual studies are described in detail at the beginning of each investigation.

5.1 Participants

5.1.1 Schools

Twelve state-funded U.K. primary schools were approached as potential participants in this project. Six agreed to take part, and the same schools and classes participated in all studies. All schools were in rural Oxfordshire.

Since there is substantial variation between schools, interpretation of the results of studies with small sample sizes is potentially problematic. In consequence the potential participating schools had been deliberately selected on the basis of their comparative homogeneity (percentages of children with/without FSM, EAL, or SEN, and overall absence rate). Schools 2-6 had below-average rates for FSM, EAL, and SEN when compared with English primary schools as a whole. School 1 had 25% children with EAL, primarily due to location of a higher education establishment with substantial numbers of overseas students within its catchment area. Absence rates at the schools were average or below-average. Table 22 summarizes school characteristics.

Table 22 Characteristics of participating schools

	Number of children on school roll	FSM % (DfE, 2012a) (2011-2012)	EAL % (DfE, 2012a) (2011-2012)	SEN % (DfE, 2012b) (2011-2012)	Overall absence % (DfE, 2013b) (2011-2012)	Ofsted grading (Ofsted, 2012d)
English primary schools	251	19	18	17	5	
Oxfordshire primary schools	213	12	11	16	4	
Participating schools						
1	265	4	25	2	5	Good
2	157	3	0	5	4	Good
3	109	MD ¹	0	4	4	Good (with elements of outstanding)
4	69	9	0	4	4	Good
5	109	13	3	11	5	Satisfactory
6	222	6	MD	4	4	Satisfactory

¹ MD: missing data

5.1.2 Classes and teachers

There were eight classes with Year 5 children at the six schools (see table 23). The length of teachers' careers ranged from 5-19 years (none having taken extended leave). Two of the teachers who taken part in study 1 taught the same class (Esther and Felicity). When teacher data was necessary for analysis of studies 2-6, only Esther's was incorporated since she conducted the majority of the literacy tuition. Five of the schools (2-6) had enrolments smaller than the average for English primary schools. There were consequently some classes with mixed Year groups. For these, data was collected only from Year 5 children.

Table 23 Characteristics of classes and teachers

Class	Length of teacher career (years)	School	Year	Total number of Year 5 children in class	Number of Year 5 children with:			Total number of Year 5 children with FSM/EAL/SEN ¹
					FSM	EAL	SEN	
1	12	1	4/5	12	1	5	1	7
2	19	2	4/5	15	0	0	1	1
3	10	1	5	26	1	4	1	6
4	5	3	5	15	0	0	0	0
5	13	6	5	29	1	0	1	2
6	16	2	5/6	10	0	0	0	0
7	20	4	5/6	14	1	0	1	1
8	10	5	5/6	14	2	1	4	5
Total				135	6	10	9	22
Mean per class				16.88	0.75	1.25	1.13	2.75

¹ There were three children with combined FSM and/or EAL and/or SEN. Since there were fewest children with FSM amongst the with FSM/EAL/SEN participant pool, the two children with FSM and SEN were classified as with SEN in the analyses. The class teacher at school 5 considered that the SEN characteristics of the child with EAL and SEN made a bigger impact the EAL so that child was classified as with SEN.

5.1.3 Children

Demographic characteristics of the children whose work was sampled were obtained from head teachers:

- Gender
- Date of birth
- FSM status (qualification for free school meals)
- EAL status
- SEN status (school action, school action plus)

Of the 135 child participants, there were 70 boys (mean age: 10.18 years; SD: .26) and 65 girls (mean age: 10.14 years; SD: .32). An independent t-test was conducted to compare the ages of the male and female participants (age data was not available for school 4). There was no significant gender difference: $t(119) = .652, p = .516$.

Thirty-four children (17 boys, 17 girls) were categorised as having missing data (see section 5.4.3.3 for details). Out of the children with missing data, 38% were with FSM/EAL/SEN. The corresponding percentage for children without FSM/EAL/SEN was 22%.

Following exclusion of children with missing data, 101 children remained (see table 24), 53 boys and 48 girls.

Table 24 Characteristics of children without missing data

Class	Total number of children	Number of children after exclusion of those with missing data		Mean age of remaining children (SD)	
		Boys	Girls	Boys	Girls
1	10	6	4	10.01 (0.24)	9.94 (0.16)
2	13	8	5	10.07 (0.25)	10.06 (0.14)
3	17	13	4	10.26 (0.26)	10.08 (0.38)
4	12	8	4	10.25 (0.29)	10.19 (0.25)
5	19	6	13	10.14 (0.21)	9.99 (0.34)
6	8	3	5	10.50 (0.22)	10.42 (0.23)
7	11	4	7	10.05	10.05
8	11	5	6	10.27 (0.24)	10.46 (0.30)
Mean				10.19	10.15
Total	101	53	48		

Of these 101 children, some qualified for FSM, used EAL, or had SEN (N = 22). Since there were comparatively few they were considered as a single group. Table 25 shows the characteristics of these two groups of children.

Table 25 Mean numbers and ages of children with and without FSM/EAL/SEN

Group	Without FSM/EAL/SEN		With FSM/EAL/SEN	
	Boys	Girls	Boys	Girls
Number	39	40	14	8
Mean age (SD)	10.19 (0.27)	10.16 (0.33)	10.21 (0.27)	10.08 (0.31)

The student participant pools varied according to study – associated with qualification for FSM, speaking EAL, having SEN, and evidence of missing data. Details of participant groups for the individual investigations are given at the start of each study.

5.2 Ethical approval

Ethical approval was received from Oxford Brookes University’s Research Ethics Committee (see Appendix E and Appendix F: parent information sheet and parent consent form).

Head teachers were first approached by letter and telephone. Those who expressed an interest were offered the opportunity to hear more details about the research in a meeting at the school. If the head teacher gave permission, the study was explained to Year 5 teachers, who were then asked by the head teacher if they would like their classes to take part.

5.3 Data collection

5.3.1 Classes and class teachers

There was a short teacher questionnaire (see Appendix G) including, for example, perceived adequacy of training in both handwriting tuition and the promotion of children's handwriting speed. Teachers were also asked whether pupils used individual whiteboards (rarely the case and almost entirely for numeracy).

Two teachers who did not participate in the research had piloted the questionnaire. Following the piloting, minor modifications were made.

5.3.2 Children

As previously discussed, amount of work completed over an extended time period has only been considered in terms of duration of writing episodes, which does not take account of individual differences in fluency. A more valid measure is number of letters committed to paper. This provides an estimate of amount of handwriting and spelling practice across the curriculum over the data collection period and also extent of opportunity for practice in higher-level processing.

5.3.2.1 Photography

Photography was chosen as method of data-collection because the data could be uploaded directly onto a computer rather being photocopied and subsequently scanned. The photography was carried out using a Samsung 10.2 mega pixels camera.

All of the handwritten work carried out by each child at school or completed as homework over a period of seven consecutive days was photographed. It was emphasised that it was important that all handwritten work was included since a principal aim was to measure the overall amount of handwriting carried out. One to three photography sessions were carried out at each school, determined by teacher preference and class size. Every photograph was labelled using the unique ID number allotted to each child.

The teachers were asked to select a week for photography which would reflect the normal school routine. It was explained that weeks during which the children were away from school on visits or extensively engaged in out-of-class special activities would be inappropriate. Teachers were able to opt either for photography of the current week's written (six classes), or retrospective photography from a previous week (two classes). The latter option was chosen by teachers who felt that end-of-term activities were impacting on the amount of writing currently being carried out, and that work from a previous week was more representative of amount of writing which took place in a typical school week. In order to process undated work, or for retrospective scoring, it was assumed that a given item of work was carried out on a particular date by all children.

5.4 Data scoring

Photographs were assembled into files unique to each child. Transcriptions were made which included all decipherable letters (including interpretable crossed out/scribbled over/rubbed out writing) since they represented components of handwriting skill practice. Digital numerals were not transcribed since the majority of number symbols are unique to numeracy and some are sufficiently different (e.g. "4") that different GMP (generalized motor programs) may be involved. Furthermore, the meaning of numerical symbols within numbers is not related to the phonological relationships associated with letters. Punctuation and correctness of usage of upper- and lower-case letters were not transcribed (although they were taken into account in study 6).

5.4.1 Letter count

The first data extracted from the transcripts was letter-count, a measure of the amount of handwriting practice carried out by each child across the curriculum during the data collection week. To achieve this, after punctuation had been removed from the transcripts, a character-count was carried out using the word-count menu of the review function of Microsoft

Word. All detectable letters were counted even if they had been erased, crossed out, or scribbled over (i.e. were not included in children's final drafts).

5.4.2 Spelling error rate

All words and fragments of words originally written by the child but subsequently rejected were eliminated, leaving the child's apparently-intended final draft. Spelling errors were identified. Spelling was scored as percent spelling error rate in Studies 3 and 4, commonly used in studies investigating predictors of compositional quality, as discussed in Dockrell et al. (2015), Gansle et al. (2002), Graham et al.(1997) and Olinghouse and Leaird (2009). A more complex scoring system was used in Studies 5: (phonologically plausible vs. phonologically implausible) and Study 7: use of spelling strategies, as incorporated in Assessing Pupils' Progress (APP). These procedures are described in the method sections for the two studies.

5.4.3 Composition

5.4.3.1 Word-level

Following correction of spelling errors, the draft was uploaded into the English Lexicon Project (ELP; Balota et al., 2007). The output for each child included the identities of all words used (word-types) and numbers of times each word was used (word tokens), mean word length (number of letters) and mean word frequency.

ELP word frequencies are taken from the Hyperspace Analogue to Language (HAL) frequency norms (Lund & Burgess, 1996). The Children's Printed Word Database (M. Stuart, Masterson, Dixon, & Quinlan, 2002) and Children's BBC word frequencies in SUBTLEX-UK (Van Heuven, Mandera, Keuleers, & Brysbaert, 2014) were considered as alternative sources of word frequencies. The Children's Printed Word Database includes words found in books read by children aged 5-9 years and was unlikely to include all words written by children aged 9-10 years. Similarly, whilst the Children's BBC age-band is 6-12 years, not all vocabulary associated with the NC is included. The HAL corpus contains

approximately 131 million words, derived from 3,000 Usenet newsgroups in February 1995.

Word frequency is strongly skewed; Zipf's Law (1949) states that the frequency of a word in a database multiplied by its rank frequency is constant (i.e. the most frequent word is twice as frequent as the second most; the 10th most frequent is twice as frequent as the 20th most frequent). In consequence, log word frequency is widely used since it facilitates data interpretation. For example, the most frequent word in the HAL database, 'the', has a frequency of 23,099,033 in non-log values, whereas the log frequency is 16.96.

Subsequently, using the children's final drafts, a database of all words used by the children and the frequency of their occurrence was created. This comprised approximately 4,700 word-types (i.e. different words), and 61,000 tokens (i.e. total word-count) of which approximately 6.5% were misspellings. Morphemic variations were included as separate words (e.g. cat and cats are two separate words).

5.4.3.2 Sentence- and discourse-level

Studies 6 and 7 included assessments of C-gen genre-writing using APP scoring. This incorporates sentence-level punctuation and grammar, and the structure of text at paragraph and discourse-levels (see chapter 3).

5.4.3.3 Missing data

Some children's portfolios of work did not include all activities carried out by their classmates. This may be a consequence of absence from school or items of work not being supplied for photography. In addition, there was within-class variation in the number of tasks undertaken. For example, children who had worked quickly may have been given extension work and children who speak EAL or have SEN might have support out of class. It was assumed that core work (i.e. not extension tasks or additional support) will have been done by all children. To identify this work tables were drawn up for each class and tasks undertaken by each child were identified

from the transcripts. If the core work was not evident, those children were considered to have missing data.

5.5 Method sections for individual studies

The details of children participating in each individual study are described in the relevant method sections. This includes, for example, whether children with missing data or those with FSM/EAL/SEN took part.

Studies 5 and 6 involve subsets of the data. Study 5 investigated types of spelling errors (phonologically plausible vs. phonologically implausible) occurring in T-gen and C-gen writing. Study 6 compared vocabulary used in T+G-gen writing in lessons in which children are prepared for C-gen genre writing with that used in the genre-writing tasks themselves. The data subsets are described in detail in the method sections for each study.

Analyses specific to each individual investigations will be described in the method section for each study.

5.6 Limitations

Study limitations are considered principally in the General Discussion chapter since some are common to more than one investigation.

6 Study 2: A CATEGORISATION OF CLASSROOM WRITING ENVIRONMENTS

6.1 Introduction

Study 1 provided rich information about nine Year 5 teachers' perspectives on their experience of and beliefs about writing tuition. Chapter 2 included reviews of a series of teacher surveys of literacy tuition (including Barnett et al., 2006; Dockrell et al., 2016; Graham, Harris, et al., 2008), each of which provided information about, for instance, classroom activities, timetabling and teacher training. However, comparatively little is known about the writing committed to paper every day in the classroom.

Written classroom activities enable recording, organizing and learning curriculum information through writing. Activities range between those in which the content is generated by teachers, by teachers and children together, or generated by children. There is a lack of knowledge of the cognitive impacts of with these types of writing environments, for instance relative demands placed on working memory resources and effectiveness in promoting learning. Also critical is whether the learning is generalizable, for example extent of transfer from unfamiliar words introduced by teachers into self-generated writing (examined in detail in Study 6).

6.2 Writing environments

Especially for complex skills which require simultaneous processing of multiple sub-skills, both learning and performance may place significant demands on working memory reserves (Sweller, 1994, 2016). Should demand be excessive there may be cognitive overload, resulting in less efficient learning and compromised quality of processing and performance. Supervision by teachers of demands on working memory would appear likely to promote learning effectiveness.

Explicit instruction is specifically intended to manage working memory demands (Archer & Hughes, 2011) and Sweller (2016) concluded that there is ample evidence that explicit instruction is effective. The meta-analysis findings discussed in chapter 2 suggested that the effects of explicit instruction in transcription often generalized to compositional writing, consistent with the widely accepted relationship between automatization of handwriting and spelling skills and compositional quality. However, investigations into explicit instruction have not compared its effectiveness with alternative writing environments.

Note-taking

Chang and Ku (2015) investigated the effects of note-taking instruction on reading comprehension (children aged 9-10 years). Children who took notes with or without explicit tuition were compared with children who did not take notes. In a note-taking task carried out two weeks post-intervention, copying was reduced in the explicit instruction group (18% to 8%) but not in either of the other groups. The explicit instruction group also had the greatest reduction in word count, and included more visual representations and key concepts. In a comprehension test on unrelated material five weeks post-intervention, the instruction group had higher scores than the other two groups between whom there was no significant difference. These findings implied that note-taking was improved by instruction and benefited comprehension of an unrelated text, but only after explicit instruction.

Copying

Little is known about copying, particularly when carried out by children. In their investigation of word copying in adults, Bonin, Méot, Lagarrigue, and Roux (2015) identified word frequency effects, with greater latencies between word presentation and initiation of pen-movement for lower frequency words. This effect was linked with semantic processing. In addition, Bonin et al. found a word length effect (number of letters) with greater latencies for longer words, attributed to the larger amount of visual

encoding required. The word length effect was considered to denote non-lexical processing.

Copying would appear likely to impose a high level of cognitive demand on primary school age children with repeated cycles of visual encoding, construction of orthographic representations and written production.

Laishley et al. (2015) compared the copying of single long and short words by adults and children (7-10 years). It was very rare for adults to relocate gaze during word copying, and word frequency and length effects indicated that words were processed semantically, i.e. encoding periods were shortest for short high-frequency words, suggesting processing of whole words.

Children's responses to short words (four letters) were similar to adults.

However, there tended to be gaze direction shifts in long words (eight letters) and since letter-position coding is not likely to be fully developed by 10 years of age (Castles et al., 2007) relocating the correct position on the source material may be problematic. Laishley et al. also found that only half of the mid-word gaze-shifts reflected syllable boundaries. Furthermore, the neither the frequency effect nor the length effect were evident. Overall, these findings suggest non-lexical processing, circumventing semantics.

This may impact on knowledge acquisition and comprehension.

Afonso et al. (2018) compared copying and spelling-to-dictation performance. There were disparities between responses in the two conditions although these differences decreased with age. Written latencies were longer in copying than spelling to dictation, and word frequency had a significant effect on latency in copying but not spelling-to-dictation. A possible explanation was additional demand deriving from recognising and reading words in copying but not spelling-to-dictation. Conversely, written duration was longer in spelling to dictation than copying, potentially due to the necessity for sub-lexical processing in words with less well-internalised spellings.

Self-generated writing

Independent or self-generated writing enables demonstration of knowledge gained via activities such as explicit teaching, note-taking, and copying. It also offers an opportunity for creativity and enables practise of higher-level writing skills. Together these processes are likely to be cognitively demanding. There are, however, a range of strategies to reduce cumulative burden on working memory. For example, vocabulary in self-generated writing is self-selected and consequently likely to be familiar (Dobbs & Kearns, 2016) and children are able to avoid words which are difficult to spell. For more experienced writers, working demands may be reduced through extensive genre and content knowledge and effective planning skills (Kellogg, 2008).

Adams, Simmons, Willis, and Porter (2013), Chenoweth and Hayes (2003) and Torrance and Galbraith (2006) have suggested that in self-generated writing a phonological 'inner voice' (transitory storage of intended text in a phonological format) stores narrative content immediately before it is committed to paper. This enables writers to monitor the narrative structure and is also likely to include phoneme sequences (M. Torrance, personal communication, June 27, 2019). If children are uncertain of orthography, the phoneme sequence would provide a resource facilitating a spelling attempt. Although the spelling generated might be incorrect, there may be a tendency towards phonological plausibility.

6.2.1 Classifying classroom writing environments

Only three published studies have recorded the nature of the entire range of written work carried out at school (Brindle et al., 2016; Coker et al., 2016; McHale & Cermak, 1992b). Each was carried out in the US. In each case, the work was categorised into three writing environments, focussing on the extent of teacher-control of written content as against self-generation by children. As shown in table 26, they were markedly similar.

Table 26 Classroom writing environment classifications

	Low child autonomy High teacher autonomy	Balanced autonomy between children and teachers	High child autonomy Low teacher autonomy
McHale and Cermak (1992) (Grades 2, 4, 6: 7-12 years) Day-long observation per class Duration of time per activity measured	Low student control (e.g. copying, repeated writing of words in spelling lists, writing headings and dictation)	Medium student control (e.g. taking notes, completing workbooks and written comprehension)	High student control (e.g. creative writing)
Brindle et al. (2016) (Grades 3, 4: 8-10 years) Teacher survey	Teacher centred Correct writing (correct grammar and spelling; production of finished essays in a single draft)	Explicit instruction Control shifting from teachers to children (direct teaching of higher and lower-level writing skills; strategies to manage working memory reserves)	Natural learning Child-centred (informal and incidental instruction)
Coker et al. (2018) (Grade 1: 6-7 years) Time-sampled observations. Four day-long sessions per class, separated by ~55 days	Correct/copied writing (response with single correct answer on a worksheet or copying)	Written response to reading (carried out by teachers or, alternatively, individual children)	Generative writing (creation of at least one sentence in response to an open question)

The studies were naturalistic and examined real life classroom experience rather than experimenter designed content. However, since they were either observational or, in the case of Brindle et al., carried out using a teacher

survey, neither the text actually written by children nor the amount committed to paper were recorded. Study 2 investigated this gap in knowledge.

Aim

The aim of Study 2 was to transcribe and describe the entire range of writing tasks undertaken by Year 5 children during one typical school week and allocate each item of writing to one of three writing environment categories: teacher-generated (T-gen), teacher + child-generated (T+C-gen) and child-generated (C-gen).

Objectives

- (1) To record and transcribe all items of written work undertaken by Year 5 children aged 9 – 10 years over a period of one typical school week.
- (2) To assign the items to categories in a writing environment scheme
- (3) To provide a descriptive overview of writing in each category.
- (4) To consider the findings in terms of the results of study 1.
- (5) To provide data for the remaining studies (Studies 3-7).

6.3 Method

See Chapter 5, method studies 2-7.

6.3.1 Participants

The written work of all 135 children described in chapter 5 was analysed. Children with missing data or qualifying for FSM, using EAL, and with SEN were included in order to provide a full description of the range of work in the classroom.

6.3.2 Data

6.3.2.1 Writing environments

The three writing environment classification schemes described earlier were integrated into a single scheme (see table 27). The categories in the integrated scheme ranged from entirely teacher-generated writing content (T-gen) to entirely child-generated (C-gen). Between these extremes was an intermediate category entitled teacher + child-generated writing (T+C-gen) in which written content was influenced by both teachers and children).

Table 27 Integration of writing environment schemes

Integrated scheme		T-gen writing (e.g. copying from class whiteboard, handwriting work sheets, spelling lists)	T+C-gen writing (e.g. explicit teaching, note-taking, question/answer tasks such as comprehension tests)	C-gen writing (e.g. independent text generation at word-, sentence- and discourse-levels)
Contributing schemes	McHale and Cermak (1992)	Low student control	Medium student control	High student control
	Brindle et al. (2016)	Teacher centred	Explicit instruction	Child-centred
	Coker et al. (2018)	Correct/copied writing	Written response to reading	Generative writing

Table 28 defines and describes the characteristics of the writing environment categories in the integrated scheme used in the current project.

Table 28 Writing environment categories

Writing environment category	Characteristics
Learning environments	
T-gen writing	<p>All vocabulary and word sequences are determined by teacher and conveyed to children using a whiteboard or textbooks/ worksheets (i.e. almost invariably copied).</p> <p>Variation between children is a product either of unfinished work or spelling errors.</p>
T+C-gen writing	<p>Key topic vocabulary is introduced by teacher, for example on a class whiteboard in explicit teaching or written questions in textbooks/work sheets. The vocabulary is then used in words/phrases/sentences generated individually by each child.</p> <p>Variation between children is a product of content of the words/phrases/sentences generated by children in supervised text-generation, word choice influenced by both children and teachers, and spelling errors.</p>
Production environment	
C-gen writing	<p>All vocabulary and word sequences are determined by children.</p> <p>Variation between children is a product of amount of vocabulary previously encountered which has been processed at sufficient depth to enable its expressive use, word choice, sentence and discourse knowledge, and spelling errors.</p>

6.3.3 Analysis

All handwritten work completed during the data collection period was transcribed. Items of work were grouped according to type of writing activity taking place, for example copying lesson content, writing during explicit teaching, or self-generated writing (see table 29). Each activity was allocated to one of the three writing environments described above.

6.4 Results

The initial part of the results section lists the types of written activities undertaken and shows how they have been divided into writing environments. Subsequently there is a detailed description of writing in each of the writing environments, using examples from every class.

6.4.1 Spectrum of written work activities

Table 29 shows the writing activities undertaken in the eight participating classes, grouped into the three main categories. In some instances only a proportion of the children in a given class undertook certain activities, for example additional handwriting practice or extension activities for children who had completed class-work faster than their peers. Such activities are bracketed.

Table 29 Spectrum of handwritten work undertaken by children across classes, separated into writing categories

Handwritten work activity	Class								Number of classes	
	1	2	3	4	5	6	7	8		
T-gen writing										
Days and dates ¹		✓	(✓)	✓	(✓)	✓	(✓)			3
Copied headings	✓	✓	✓	✓	✓	✓	✓	✓		8
Copied lesson content	✓	✓	✓					✓		4
Copied handwriting practice	✓	(✓)		✓						2
Copied spelling practice				(✓)		(✓)				0
Spelling tests	✓	✓		✓	(✓)	✓				4
T+C-gen writing										
Explicit instruction	✓	✓	✓	✓	✓	✓	✓	✓	✓	8
Question/answer				✓		(✓)	✓			2
C-gen writing										
Word/phrase/sentence writing	(✓)	✓	✓	✓	✓	✓	✓	✓		7
Single-paragraph writing	✓	✓	✓	✓	✓	✓	✓	✓		8
Multi-paragraph writing			✓	✓	✓		✓	✓		5
Draft child-generated writing			✓					(✓)		1

¹ Although handwritten days and dates are included in this table, they have been excluded from all other analyses, as formatting varied – e.g. Monday, 2nd June, 2012 vs. 2/6/12 (i.e. entirely numbers) also it could not be determined whether names of the days and months were copied or self-generated. In addition, all identifying details for children and schools have been omitted since frequency of inclusion of identifying details again varied widely. Overall this accounted for a very small percentage of words written

² Explicit teaching incorporates elements such as goal setting, teacher modelling (e.g. demonstration of letter join formations with verbal commentary), and decreasing teacher input as competence increases and cognitive load decreases.

The tasks shown in table 29 are similar to those described in Coker et al. (2018), Brindle et al. (2016) and McHale and Cermak (1992b) (table 26).

The most frequent writing activities undertaken by whole classes in each writing environment were:

T-gen writing	-	copied headings
T+C-gen writing	-	explicit instruction
C-gen writing	-	word-level and single paragraph-level

Handwriting and spelling practice and question/answer tasks were comparatively infrequent during the data collection week. Only one school specifically asked all children to write a draft of a multi-paragraph writing task. This was evaluated by the teacher and edited by the child, followed by production of a final draft for the purposes of display.

There was considerable variation in the number of different types of writing undertaken by whole classes during the data collection weeks. Data from class 5 suggested the least variability, the writing activities undertaken by all children comprising: T-gen headings; T+C-gen explicit teaching; child-generated writing at word- to sentence-level, paragraph-level, and multi-paragraph child-generated writing (five in total). In contrast, in class 4 all children completed: days/dates, headings, handwriting practice, spelling tests, explicit teaching, question/answer format, C-gen writing up to paragraph-level, and multi-paragraph child-generated writing (nine in total).

6.4.2 Writing environments

This section provides examples of work in the three writing environments. The examples were chosen in order to demonstrate the range of types of written content across the classes. Although children did not always complete tasks (particularly copying), the examples given here are, nonetheless, relatively complete (i.e. few words were omitted) since they indicate teacher intentions.

6.4.2.1 T-gen writing

T-gen text was identified through consistency of wording across classes / teaching groups, after making allowance for spelling errors and omission of words. Examples of T-gen writing are shown in table 30.

Table 30 Samples of writing taken from T-gen text.

In each case the text reported is the total output generated in the data collection week by a given child. (Words in brackets had been misspelled.)

	Examples
Days and dates	in most cases: weekday, day (numeric ordinal), month
Copied headings class 5, child 111	I can represent data in a graph or chart. I can explain why I chose this particular one. I can divide a digit number by a digit number. I can identify the key points of an argument. I can write a persuasive argument. Next steps: Challenge what is your (favourite) wild animal? Sad eyes and Empty lives
Copied instructions class 3, child 19	What I am Looking for: Descriptive Formal (non-chronological) 3rd Person Sub-titles rhetorical questions (expertise)
class 8, child 99	Microorganisms are tiny living things 1. Microorganisms or microbes can (only) be seen through a microscope. 2. There are millions of microorganisms in the soil, air, water and even humans body 3. Some microorganisms are useful, but some are Dangerous 4. Bacteria and viruses are microorganisms. Helpful Microorganisms do (important) jobs 1. Bacteria helps make vinegar, cheese and (yoghurt). 2. Bacteria rot down dead organisms and put (nutrients) in the soil for plants to help them grow. 3. Yeast is a microbe: (it is) used to make bread and beer

<p>Copied handwriting practice class 2, child 50</p> <p>class 4, child 72</p>	<p>Harmful Microorganisms can cause (Disease)</p> <ol style="list-style-type: none"> 1. They cause (disease) and illness. flu, colds, measles, (chickenpox), Aids and lots more. 2. Microorganisms causes tooth (decay) 3. Microorganisms can cause food to go (mouldy). <p>Four ways to (spread) (disease)</p> <ol style="list-style-type: none"> 1. (From) coughs and sneezes. 2. From (touching) infected of objects. <p>snake snake snake slither snake slither snake slither slide slide snake slither slither snake slide snail snake snap sneeze sniff snail snake sneeze sniff snow snooker snore snatch snow snooker snare snatch snail sneeze snow snore snake</p>
<p>Dictated spelling tests class 2, child 49</p> <p>class 5, child 125</p> <p>class 6</p> <p>Copied word lists</p>	<p>Most (people) take drugs – for example: cough medicine, an asthma puffer and headache tablets. These drugs keep us healthy or help us to recover when we are ill. But some drugs can be very dangerous if used in the wrong way. Heroin and cocaine can be prescribed by doctors for people who are seriously ill. But when addicts take them then these drugs are being in the wrong way. This is known as drug abuse and (overdoses) can be fatal.</p> <p>The Greeks (believed) that gods and (goddesses) watched over them. The gods were like humans, but immortal (they lived forever) and much more powerful. A family of gods and goddesses lived in a cloud palace above Mount (Olympus), the highest mountain in Greece. The gods watched down to see what people were doing, and from time to time he (interfered) with what went on. The gods did not always behave very well. Their king, Zeus, was always being unfaithful to his wife, Hera. He (appeared) on Earth as a human or animal to trick women he had fallen in love with.</p> <p>table floatable collectable stable flammable indestructible friendship understandable vulnerable constable unable</p> <p>conceited receipt perceive yield neither protein achieve receive diesel mischief</p> <p>a) class classroom grass glass pass ask asked after last blast fast path father rather cannot</p> <p>b) touch touched couple young younger country trouble double</p>

allocated for the three spelling groups within the class)	burglar burglary turnstile surprise suburb c) awful awfully awkward awkwardly drawn drawing draw withdraw sprawl sprawling bawl bunting jaw prawn roar sawdust strawberry thaw law lawyer unlawful
Copied spelling practice class 6, child 58	burglar burglar burglar burglar burglar burglar burglar withdraw withdraw withdraw withdraw withdraw withdraw unlawful unlawful unlawful unlawful unlawful unlawful awfully awfully awfully awfully awfully

While the most frequent form of T-gen writing was work headings, the purposes of the headings varied between classes. Most frequently they were statements of teaching objectives or learning targets (e.g. “I can write a persuasive argument”) which were associated with the NC. Less common were headings such as “The Journey of Chocolate”, “Cubist Collage” or “The Easter Story”. Some of the vocabulary and word-spellings in headings were complex. For example, in class 5, 25 children wrote the phrase: “I can write a persuasive argument”. Fourteen of these copied headings contained spelling errors.

Seven class teachers mentioned giving handwriting tuition in their interviews but there was evidence from only three classes (and for two of these the data was solely from children undertaking additional practice). Handwriting practice for children experiencing difficulties tended to involve photocopied sheets of exercises which sometimes included tracing letter forms and words. In contrast, class 4 handwriting practice was completed by all pupils (15 minutes per day) with the aim of increasing copying accuracy.

As specified in the NC, spelling tuition at English primary schools is based on synthetic phonics. By upper Key Stage 2 children will have encountered multiple valid phoneme/grapheme relationships for many individual

phonemes. The class 5 spelling list during the data collection week included:

conceited, receipt, perceive, yield, neither, protein, achieve, receive, diesel, mischief

These are minority spellings of ē (each ≤5%, Carney, 1994). The NC for spelling required children to have been taught more common correspondences several years earlier (e.g. /ee/ and /ea/ in Year 1, each accounting for approximately 25%) (DFES, 2001a).

Spelling lists were typically 10-12 words long and each consisted of items with phonological or orthographical or morphological patterns in common (e.g. /eu/ spelled either 'ue' or 'u-consonant-e'; or suffix -ful). In addition, there were also words described as 'optional' in spelling lists at three schools (challenging words unrelated to the target spelling pattern).

Developmental grouping of children for spelling occurred in three classes. In these classes there might be a spelling pattern common to all three lists but with longer words for more confident spellers or, alternatively, the target pattern varied between lists. There was very little data associated with spelling practice. Spelling tests occurred during the data collection weeks for classes 1, 2, 4, 5 and 6. All words were classified as either correct or incorrect.

While science was typically taught using T+C-gen writing, some involved copying lesson content from a class whiteboard. Children in class 8 (N = 14) had been required to copy text about microorganisms from the class whiteboard (total word count: 135). No children completed the entire text, but different sections/words had been omitted allowing identification of the complete word sequence.

There was a large range in numbers of words written: 38 – 128 copied words (61%, range 30% - 95%). The most complete version was written by child 99 and was shown in table 30. Table 31 shows the number of children who completed the copying of each section of the text. It demonstrates that very few children finished the final two sections. Since

there was unconnected science work immediately following the microorganisms copying task in the children’s exercise books, this indicated that that no additional time had been allowed in future lessons.

Table 31 Rate of completion of copying task content

Sections in written lesson content	Number of children who did not complete section
Introduction	3
Useful micro-organisms	6
Harmful micro-organisms	11
Four ways of spreading disease	12

Data from other lessons showed that whole-class copying tasks were often not completed, suggesting that teacher-generated time-pressure occurred in at least some instances.

6.4.2.2 T+C-gen writing

T+C-gen writing entails elaboration by children of teacher-supplied concepts and vocabulary. Several types of T+C-gen writing were identified from the data transcripts, most frequently explicit teaching and question/answer tasks.

Explicit instruction

During the data collection weeks, explicit instruction appeared to have been used principally in English and science (see table 32). In some instances, the explicit teaching was intended as a preparation for a genre-based writing task.

Table 32 Topics including explicit teaching from the data collection weeks:

Class	Topic
1	Properties of materials
2	Preparation for writing a newspaper report
3	Signs of life, plant life cycle
4	Preparation for non-chronological report writing, Experiment: heart rate and exercise
5	Cooking and hygiene
6	Preparation for persuasive writing
7	Preparation for narrative retelling writing, Experiments: left/right preference, taste-testing, invisible ink
8	Analysing a historical recount

The most complete data concerned with preparation for genre-based writing tasks was collected from classes 4 and 6, although the class 6 genre-writing task was not completed during the data collection week. Examples are shown in table 33. Children in class 5 took formal notes from conflicting articles concerning the ethical basis of zoos before writing a persuasive argument for or against zoos. Class 2 pupils took informal notes while listening to an interview with a footballer, before writing a newspaper report. Pupils in classes 1 and 7 drew diagrams summarizing, respectively, instructions for a game and the plot of *A Midsummer Night's Dream* as preparation for their genre-based writing tasks. In all of these cases the preparatory work was highly task-specific. The preparatory work for the class 3 and 8 writing tasks appeared to be less task-specific.

Table 33 Samples of writing taken from T+C-gen explicit teaching sessions. associated with preparation for genre-writing tasks

(words in brackets were misspelled)

Class/ child	Example	
	Language copied during teacher modelling	Children's writing in guided practice
class 6 child 57	Advertising Advertisements Persuasive language: (stylishly) finished dazzling (colours)	Hampton Court Palace (Persuasive) (Language): as you stroll around six acres of magnificent buildings, each and every corner will capture your heart, mouth-watering, Magnificent of the great hall. Persuasive (Language): Explore the sixty acres of beautiful gardens.
	Rhetorical Questions	Rhetorical Questions: why not pick up some of the mouth-watering recipes at the kitchen shop
	Long list Separated by Commas	Long list (separated) by commas: up staircase, beneath Anne (Boleyn) gateway you'll find the State apartment of eighth, the setting for some of the key events in his life.
	Present Tense Imperative verb	Present tense imperative verb: Discover the magnificent of the great hall and the mystery of the haunted gallery
	Metaphor: The (new) litre engine is a tiger (Alliteration): (summer) (skies)	(no data) (no data)
	Puns Short Phrases with no verbs (Slogans)	(no data) (no data)
	class 4 child 64	Non-chronological report
Vocabulary		Hades, Cydra, Tartus, Spits Poison, Spirits, Blood, Lava, Cyclops eye, Bear Claws, Eagle Talons, Scorpion sting, Dragon Wings, Bronze fur, Scary, Cautious, (destructive), Fatal, Male, Ferocious, Muscular, Lethal.

<p>Introduction What is the text explaining? Vocabulary Connectives Openers/generalizers Legend has it that the (Description) of the beast Vocabulary</p> <p>Connectives Openers/generalizers The ... was described as ..</p> <p>The beast's powers/special features/behaviour. Vocabulary Connectives</p> <p>Openers/generalizers The ... was said to have many powers including the ability to</p> <p>How it was created and why Vocabulary</p> <p>Connectives</p> <p>Openers/generalizers</p> <p>Myth that makes it famous. Vocabulary</p> <p>Openers/generalizers</p>	<p>Melted, Small, (Flat faced), (slimy), (scaly), Stick thin</p> <p>Ancient Greek monster, Cydragosus Cydra Ravaged the city of New York Which, And, Also</p> <p>Legend has it that the (Cydragosus) was ..</p> <p>Body of bronze, sting of Scorpion, claws of (bear's), talons of an eagle, Dragon's wings and a fire coloured Cyclops eye. And, Apart from, Also, Although</p> <p>The Cydragosus was described as ...</p> <p>Chop off one head two grow back. Spat poison. (breathes) fire. Feeds on Satyrs, Centaurs and demigods. Then, And, Apart from, Although, As well as</p> <p>The Cydragosus was said to have many powers including the ability to</p> <p>Created out of lava. Spirits and blood by Kronos to kill all heroes and to destroy Olympus. Then, And, Apart from, Although, As well as, However.</p> <p>It was created by Kronos out of blood, lava and spirits of monsters to destroy Olympus.</p> <p>Threw all heroes into the (fiery) remains of Tartus. Fought Hercules and got killed. Time contrast, Adding, Cause and effect.</p> <p>The Cydragosus is famous for throwing all heroes into the (fiery remains of Tartus.</p>
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	<p>How it died Vocabulary</p> <p>Openers/generalizers It was destined to die like most monsters</p> <p>Concluding paragraph Vocabulary</p> <p>Openers/generalizers The ... is often used by many contemporary writers</p>	<p>Got killed by Hercules during battle; stabbed (its) eye and so it could not see and randomly tried to jab Hercules with its sting and then Hercules chopped off (its) wings and legs and threw it off a cliff. Time contrast, Adding, Cause and effect.</p> <p>It was destined to die like most monsters getting Hercules in battle</p> <p>Modern contemporary Writers Fantasy. Modern Version, Artists. Cydragosus now means Combination of many.</p> <p>The Cydragosus is often used by many contemporary writers</p>
	Up-levelling	
class 5 child 104	<p>Next steps: I can use sophisticated connectives, such as: consequently, moreover and although in my writing. Write out a sentence, using one of the above connectives</p>	<p>My mother bought a rotten cabbage, consequently, we had to throw it away, although, it had cost a lot of money, moreover, it was quite funny.</p>
child 115	<p>Next steps: Use a noun phrase to describe how something or someone looks, e.g. The lizard with its green, scaly skin is a master of camouflage Write out a noun phrase</p>	<p>The giraffe, with its (extremely) long neck, is great at getting high leaves.</p>

Question/answer tasks

Whole-class or group question/answer activities took place in classes 4, 6 and 7, for example a science quiz and text comprehension (see table 34). In school 1 (classes 1 and 3), there was a task specific to children working in the specialist EAL unit. In it, a stimulus phrase was provided upon which

the pupils were asked to expand (the stimulus was not worded as a question since the simple phrases presented fewer linguistic challenges).

Table 34 Samples of writing taken from T+C-gen question and answer tasks

(words in brackets were misspelled)

Question/answer tasks	Examples
class 1 child 7 (EAL) (printed statements)	<p>When I first came to England ...</p> <p>I (thought) it will (snow) any day. The (weather) (was) good because the (weather) in England I like (English) (weather).</p> <p>Things I like about England ...</p> <p>I love England (because) the (weather) in England It's food I love ... school (because) the (teacher) It's good and Funny.</p> <p>I like Biff and Chip and Kipper. I love Biff is book and Chip is books.</p> <p>Things I don't like about England ...</p> <p>The (house) It's to small.</p> <p>The (pencil) is small and small</p>
class 6 child 57 (printed questions)	<p>1. On page 24 why does Rachel flick the purple button across the room?</p> <p>The purple buttons are bad.</p> <p>2. Why is Gran cross with Rachel on page 25?</p> <p>Rachel was flicking buttons away.</p> <p>3. On page 26 why wasn't the purple button flying on the floor?</p> <p>The garnet was under it.</p> <p>4. On page 28, why does Rachel change her mind about the purple buttons?</p> <p>(because) they found the garnet</p> <p>5. Would you choose the purple buttons for your new clothes?</p> <p>No (because) the purple won't look good on me.</p> <p>6. Find a button on your clothes. Then see if you can think of four words to describe your button.</p> <p>Plain, small, white, not pretty</p>
class 7 child 135	<p>Which painter was an Inventor - Leonardo da Vinci</p>

(children copied questions)	<p>name thomas (edison) Inventions</p> <ul style="list-style-type: none"> - light bulb <p>Alex Fleming discovered mould killed bacteria, this led to the invention of what drug</p> <ul style="list-style-type: none"> - penicillin <p>(doctor) (Jenner) discovered vaccination which was one of the first (diseases) that was vaccinated</p> <ul style="list-style-type: none"> - Small pox <p>Howard Carter made a (archaeological) discovery, what was it</p> <ul style="list-style-type: none"> - (Tutankhamun) tomb <p>Why does a (helium) filled (balloon) float</p> <ul style="list-style-type: none"> - Helium is lighter than oxygen <p>name a renewable energy (source)</p> <ul style="list-style-type: none"> - sunlight wind rain <p>What is the name of (second) biggest planet</p> <ul style="list-style-type: none"> - Saturn <p>a magnifying glass is what (lens)</p> <ul style="list-style-type: none"> - convex lens <p>the world largest high energy particle (accelerator) can be found 175 m below earth in swiss. name?</p> <ul style="list-style-type: none"> - <p>in which city is tallest building?</p> <ul style="list-style-type: none"> - Dubai <p>How long has (London) underground been open?</p> <ul style="list-style-type: none"> - first section in years - <p>Which Victorian person built the Great West rail?</p> <ul style="list-style-type: none"> - Isambard Kingdom Brunel <p>World first (cast) iron bridge go over? (Shropshire)</p> <ul style="list-style-type: none"> - Severn <p>American (Society) of (civil) (engineers) has made a list of wonders. name One?</p> <ul style="list-style-type: none"> - Great Wall of China
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In general, the purpose of question/answer tasks was either identification of factual details in text or the testing of acquired knowledge. There appeared to be little expectation that the children would use complex sentences, and answers were often unpunctuated.

6.4.2.3 C-gen writing

C-gen writing is characterised by children’s autonomy over word choice. The transcriptions showed that the great majority of C-gen writing was genre-based, with data from seven of the eight classes. Most children completed only one genre-based task during their data collection week. This reflects the NC schemes of work for English since each unit of work concerns a single genre and typically took two weeks to complete, including preparatory work. Genre-based writing in five classes was multi- rather than single-paragraph length, but in the other three classes very few children wrote more than one paragraph in any context.

C-gen writing was divided into word/phrase/sentence-level, single-paragraph-level, or multi-paragraph-level writing. Table 35 illustrates these various levels.

Table 35 Samples of writing taken from writing at different levels of text generation

(words in brackets are corrected misspellings)

Class/ Child	Example
Word/phrase/occasional simple sentence-levels	
class 2 child 43	COMIC I hope Kurly and piy face is out later that (evening) Hey No OH NO before That In Walters house Help No!
class 6 child 55	ADVERTISEMENT One chance only! good condition small white cat pencil case pencils not include One (chance) Only Superb Condition Piano brown not faded stool included, also books.
Single paragraph writing	
class 4 child 77	DAILY READING RECORD - The next day David took a blood sample from Laurel, her blood was (clear). When David took her pulse he felt nothing. He was sure that Laurel was a plant. - (Laurel) blossom hurt when she tucked it all inside her. She

wanted to go to the dance with David but she (could not) dance with all the petals tucked inside her. She decided to go to the dance dressed as a fairy and pretend that the flower was her wings.

- The dance was (awesome). For a second she actually felt like a real fairy. Then something dreadful happened. All of the petals on her flower wings fell (off). Anyway, it was good while it lasted.
- Laurel was troubled. Why did her flowers wilt so soon? She decided to go to Tamani again. He told her about (different) season fairies. Laurel was a (Autumn) fairy. (Autumn) fairies have the power to shape and craft, mix and make (different) things.
- Laurel also (learned) that male fairies pollenate the female flower. The male then takes the pollen and turns into a seedling. Then Laurel asked what the time was. (She) had to go.

class 7
child
133

TO WRITE A DESCRIPTION OR AN OPENING PARAGRAPH

I nearly collapsed. One second I was getting an ice cream from a man, next I was absorbed by a blue ball of light and now I am here on this beach, all alone. The wind and trees whispered to me like souls pleading for help. Suddenly, all the wind stopped and everything seemed to go in slow motion. Then, as if by magic, everything turned black and white. Trees were (upside down), waves were going backwards and two people with a (pram) were walking backwards down the beach. The man looked a lot like my father, just he was wearing a pink shirt. The thin baby was a girl and had a name tag that read out: Ekul. (Ekul) is the opposite of Luke, I thought, and then I realized. Everything's the opposite I said to myself.

Multi-paragraph writing

class 8
child
97

NEWSPAPER REPORT

Theseus is a hero!

(Theseus) was born to Athra, a princess of (Troezen). Both Aegeus, who was the King of Athens (Poseidon) loved her a great deal. Theseus therefore was born to two fathers. When Theseus was old enough he became a (soldier) and the King sent him into a maze to fight the most terrifying beast of called the (minotaur). So (Theseus) walked slowly and quietly. So if the (minotaur) was lurking around then the (minotaur) Jumped out and then Theseus bravely chopped its head off and found his way out of the maze. And (that is) why Theseus is the hero because he killed the (minotaur) and saved the world and save other people from going into the maze. But we just found out that (Theseus) found the Kings daughter and ran away (with) her so (that is) another reason why he is a hero because he saved the princess from the nasty king and so they got married and got their own castle and then Theseus was killed at

class 3
child
23

night and he was killed in a car crash in Holland with his wife. Theseus did it, and proved (us all) wrong! He is our local hero and forever will be.

NON-CHRONOLOGICAL REPORT

The Benevio Commonly name as (The) 'Bee Digester' is a newly explored species of (colourful) flora.

How can (The) 'Bee Digester' be found

The Bee Digester can be found by its bright blue (petals) and its (wiggly) purple line! Its leaves can grow (up to) (at the highest) 30 cm long and 12 cm wide. The flower itself can grow up to half a (metre) tall. Its leaves are curved and also Very sticky! It is usually found in a shady and muddy place. The leaves almost look like a chubby human face. This plant can also change (colours), so it would be really hard to find!

What does (The) Bee Digester' do?

The Bee (digester) is a plant that eats bees and ladybugs! What happens is a bee lands onto the pollen, then the plant moves a little to the side. This makes the bee sting and then the bee gets (stuck)! Next the (Petals) closed and the bee was gone!

Where can you find The Bee Digester?

The Bee Digester can be found in lovely (shady) areas (especially) (forests). The massive leaves of the forest traps most (sun) and makes it really nice and Shady! If (The) Bee Digester touches even the smallest (piece) of sunlight it will turn to dust!

How does The Bee Digester pollinates?

The Bee (Digester) (pollinates) by spitting it out by the purple (veins)! The purple (veins) have (holes) in them so that it can spit out the seeds.

Conclusion

This plant has amazing (qualities) to survive in the wild. It can be a (bee) worst nightmare, but then again it is an amazing species) that can think of a different way! This plant is also very (sensitive)!

All multi-paragraph text occurred in genre-based writing tasks. Table 36 summarises the genre-based writing tasks completed by the participating children during the data-collection week. Apart from class 7 only one genre-based writing task was completed by each child. In class 6 all genre-based work was preparatory (i.e. teacher + child-generated writing).

Table 36 Genre-writing tasks in data collection weeks completed by at least some children in the participating classes

Class	Genre	Task
1	Instructions	Game
2	Newspaper report	Football match
3	Non-chronological report	Botany of an imaginary plant
4	Non-chronological report	Mythology of a fabled creature
5	Persuasive writing	For or against zoos – essay
6	Persuasive writing preparation	
7	Narrative retelling	A Midsummer Night’s Dream
	Opening paragraph	Descriptive opening
8	Newspaper report	Feat of Greek mythological character

Assessing Pupils’ Progress (APP) scoring of writing tasks includes marks awarded for appropriate closing statements. If there are closing statements this indicates that children have completed tasks (although there may have been subsequent editing before marking).

Unlike copied writing, there was much less evidence of time pressure in child-generated writing. Completion rates for each class were calculated for any genre-writing task initiated during the data collection week and finished by at least some children. For classes 1-4 these are the minimum percentages for finished work; since marking had not yet taken place, children may have been allowed additional time subsequent to data

collection. As no children in class 7 had reached more than halfway through their re-told narrative (A Midsummer Night's Dream) and no marking had taken place, it was assumed that more time would have been allowed after the data collection period had finished.

Class 1	100%
Class 2	93% (not yet marked)
Class 3	67% (not yet marked)
Class 4	87% (not yet marked)
Class 5	93%
Class 8	100%

Mean completion rate: 90%

(Genre-based writing did not occur during the data collection week in class 6.)

6.5 Discussion

Study 2 provided a detailed snapshot of all the writing undertaken by Year 5 children during the data-collection weeks. It is the first occasion on which actual written work has been recorded to allow for detailed analysis of what children write in the different writing environments arranged by teachers. The writing was conceptualized as falling into one of three categories of writing environment. Two were learning environments: T-gen writing (content and vocabulary determined by the teacher) and T+C-gen writing (introduction of new vocabulary by teachers which was then used in child-generated text). The third was a production environment: C-gen writing (students able to demonstrate their learning and creativity).

Almost all T-gen writing was copied (with the exception of spelling tests) and most copying was from a class whiteboard. Although T-gen writing might involve words, sentences or discourse, the text was not generated by the children, and did not require planning or review (Berninger & Winn, 2006). The second category, T+C-gen writing, included explicit teaching and also question/answer tasks. T+C-gen writing often occurred at phrase/sentence- levels and typically occurred during preparation for genre-writing tasks and science. Thirdly there was C-gen, in which all vocabulary was selected by the child and used in settings ranging from single words through to multi-paragraph writing. C-gen writing consequently reflected the three levels of text-generation in the not-so-simple view of writing.

6.5.1 T-gen writing

In T-gen writing, all vocabulary and word sequences are determined by teacher. This category was derived from McHale and Cermak's (1992b) *Low student control* (e.g. copying, repeated writing of words in spelling lists, writing headings and dictation), Brindle et al's. (2016) *Teacher centred correct writing* (correct grammar and spelling; production of finished essays in a single draft), and Coker et al. (2018) *Correct/copied writing* (response with single correct answer on a worksheet or copying).

As reported in Study 1 (teacher interviews), most teachers indicated that children were rarely required to copy. Transcript evidence demonstrated that while this was the case in a few classes, it was not for the considerable majority. It would appear likely that copying is cognitively demanding for children (Castles et al., 2007; Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013; Pontart et al., 2013). Furthermore, there was evidence from the transcripts that a substantial number of children were not able to complete copying tasks at the expected speed and may consequently have had reduced opportunity to gain lesson content knowledge or understand lesson objectives.

In particular, there was extensive copying of headings in the form of lesson objectives. These were often lengthy and contained words which were long,

unfamiliar and with complex spellings. An alternative solution was used in class 4, the children being given stickers of learning goals rather than being required to copy them. In this context, while Ofsted highlighted the importance of sharing learning objectives, outcomes, and success criteria, there was no expectation that these should be copied (e.g. Ofsted, 2012b) and Kidd (2014) emphasised that copying objectives was a non-productive use of time:

Across schools all over the country, little clones write objectives in their books copied from boards plastered with two letters, LO, or two words, WALT (We Are Learning Today) and WILF (What I'm Looking For) ... Even if, in every lesson, just two minutes are spent on this, that is 10 minutes per day, 50 minutes per week and 32.5 hours of learning lost per year.
(Kidd, 2014, p. 60)

Each of the participant school handwriting policies indicated that tuition should take place throughout primary school. Study 1 interview data indicated that almost all teachers were in agreement. There was, however, comparatively little evidence of any written handwriting tuition occurring during the data collection weeks. Furthermore, the majority of teachers interviewed in study 1 considered that there was a positive association between handwriting speed and compositional quality. Despite this, there was no evidence of teaching related to handwriting speed promotion in the children's photographed work.

Handwriting practice involved teacher-generated individual word-copying and tracing activities, considered by Overvelde & Hulstijn, (2011) to be relatively inefficient techniques (modelling and writing from memory have been demonstrated to be more effective). The exercises often used vocabulary likely to be of interest to children of a younger age-group. This was shown in table 30, for child 50, for whom only three practised words had ages of acquisition exceeding 6 years (Kuperman, Stadthagen-Gonzalez, & Brysbaert, 2012).

Teachers in seven classes indicated in their interviews that they taught spelling, and there was evidence of spelling tuition in five classes. Morris, Blanton, Blanton, and Perney (1995), Schlagal (2002) and Templeton and Morris (1999) all recommended lists associated with developmental level in order to maximise learning, and this was evident in three of the classes. Out of the 52 children who completed spelling tests during the data collection weeks, only three were operating at ‘frustration’ level (ie scoring 40% or less), suggesting good teaching practice. In contrast, seven pupils scored 100% and a further 12 made only one error. Should this be replicated over several weeks, this might imply that the children with highest spelling skills may be insufficiently challenged.

There was little evidence relating to spelling practice. Such as there was involved repeated spellings which none of the studies discussed in chapter 2 identified as being as effective as, for example, self-correction (McGuffin et al., 1997; Puliatte & Ehri, 2018) or pre-testing (Schlagal, 2002, 2013). The spelling lists reflected Lin et al’s (2015, April) recommendations for inclusion of encoding, and phonological, orthographical and morphological knowledge. Synthetic phonics is a major foundation of teaching literacy skills in UK primary schools and is linked with dual-route spelling (Barry, 1994; Kreiner & Gough, 1990). Some of the spelling lists from participating classes were consistent with synthetic phonics teaching. Others were more representative of multiple resource theories (e.g. Treiman & Kessler, 2014), i.e. incorporating orthographic and morphological patterning as well as phonology. This reflects the Key Stage 2 NC in that morphology plays an increasingly large role in spelling instruction as children progress through primary school.

6.5.2 T+C-gen writing

In T+C-gen writing, key topic vocabulary is introduced by teacher. The vocabulary is then used in sentences generated by each child separately. This category was derived from McHale and Cermak’s (1992b) *Medium*

student control (e.g. taking notes, completing workbooks and written comprehension), Brindle et al's. (2016) *Explicit instruction,. control shifting from teachers to children* (direct teaching of higher- and lower-level writing skills; strategies to manage working memory reserves), and Coker et al. (2018) *Written response to reading* (carried out by teachers or individual children).

All teachers used T+C-gen writing in sessions designed to prepare children for genre-writing tasks. Often this involved explicit instruction. Introduction of topic-specific words was prioritized and there was supervised practice using the vocabulary. There was also evidence from all classes of tuition associated with planning and discourse knowledge (see Bereiter & Scardamalia, 1987; Berninger & Winn, 2006) and, as demonstrated by Graham et al. (2016), explicit teaching of executive functions is highly effective.

Note-taking and diagram creation or completion were used in preparation for genre-writing tasks and also occurred in science lessons. For example, one class was provided with short articles in favour of or against zoos, to enable the note-taking. While it was clear that some verbatim copying had occurred, there was little evidence in this study, either in the notes or in the subsequent genre-writing task, that copying signified lack of comprehension of copied vocabulary. Nonetheless, a comparison of children's notes suggested that information which was not understood might instead have been ignored.

In non genre-specific explicit instruction of English, instruction was principally addressed at assessment foci and was sometimes referred to as 'up-levelling' i.e. raising SATs marks. For this purpose, text was deliberately generated at levels chosen for specific purposes. For example, children were encouraged to create complex sentences by using connectives and adverbial clauses, or compose paragraphs including sensory information (sight, taste, smell etc.).

Unlike explicit teaching, question/answer data suggested that these tasks tended not to be conceptualized as opportunities for practising sentence construction using target vocabulary. Instead, the purpose appeared to be identification of the target words, either in questions or acquired knowledge, and their representation in written format as individual words or brief phrases. There appeared to be little expectation that the children would use complex sentences, and answers were often unpunctuated.

6.5.3 C-gen writing

In C-gen writing, all vocabulary and word sequences are determined by children. This category was derived from McHale and Cermak's (1992b) *High student control* (e.g. creative writing), Brindle et al's. (2016) *Natural learning, child-centred* (informal and incidental instruction), and Coker et al. (2018) *Generative writing* (creation of at least one sentence in response to an open question).

Children were provided with a range of opportunities for child-generated writing. There was evidence that writing occurred in a wide variety of genres, ranging from brief newspaper reports through to complex scientific reports, persuasion texts and detailed retelling of classical narratives. Multi-paragraph writing was invariably curriculum-related and children in five of the classes completed a multi-paragraph genre-writing task during their data collection week. There were no examples of creative story telling.

Graham and Harris's (2017) meta-analysis identified that there was a positive effect on compositional quality if more writing time was included in timetabling, although the amount was not specified. This notwithstanding, Gilbert and Graham (2010b) had found that children aged 9-12 years spent an average of only 25 minutes per day writing at paragraph- or multi-paragraph-levels. Not only is progress towards motor skill automaticity a product of practice (Guadagnoli & Lee, 2004; Schmidt, 1975) it is also the case for higher-level processing in writing (Kellogg,

2008). Although time spent writing was not measured in the current study, it would appear that many children may not have completed even 25 minutes. However, the teachers of classes 3, 4 and 7 timetabled extended writing tasks (an hour of child-generated writing) at weekly-to-monthly intervals.

Compared with copying, there was appeared to be less teacher-imposed time-pressure in genre-writing tasks. Indeed, one of the teachers who participated in this project explained: “we don’t have a handwriting speed scheme” or any overt expectation of a given amount of handwritten output: “they’ve pretty much unlimited time” in creative writing tasks. Overall, it appeared that completion rates for genre-writing might be considerably higher than for copying tasks.

6.5.4 Validity and reliability

The purpose of the writing environment categorisation system was to enable detailed investigations of the entire range of writing investigated in studies 2-6 in this project, focussing on the relationships between learning effectiveness, and the management of cognitive demand and the balance between child- and teacher-determined vocabulary content. Three previous studies have categorised writing environments, their systems were markedly similar, and the scheme used in study 2 was designed after studying these previous examples. As described in the introduction to study 2 and the literature review chapters, the categories relate to underlying theoretical conceptions, suggesting construct validity.

The process of identification of T-gen and C-gen writing was reliable because of the definitions of these writing environment categories. Thus the content of teacher-generated writing is common to all members of a given class. Similarly, child-generated writing content is unique to individual students. In that the remainder of the writing does not fulfil either the teacher-generated or child-generated writing criteria, definition of teacher +

child-generated writing is consequently unambiguous. Examples of categorisation were discussed with supervisors. Inter-rater reliability could nonetheless have been tested.

It could be argued that data about the content of children's writing could have been obtained from teachers. However, there was evidence from a number of sources that teacher intentions and classroom practice do not necessarily match up (see chapter 2,). For example, in current project although many teachers believed that little copying occurred during the course of classroom work this was often not the case (see Study 3).

6.6 Key points and conclusions

Study 2 incorporated transcription, description and categorisation of the handwritten work carried out by 135 Year 5 children's in a typical school week. Using a writing environment scheme developed from three previous investigations, it was practicable to categorise all written work into a three-category scheme of writing environments.

The two learning categories (T-gen and T+C-gen writing) were distinguishable not only through their definitions but also the types of use to which each was applied, with higher-level writing processing more associated with T+C-gen writing, and headings and transcription instructions with T-gen writing. Almost all C-gen writing was associated with curriculum-determined genre-tasks. As well as illustrating the real-life experience children encounter at school, this procedure has demonstrated commonalities between classes subject to the same NC whilst illustrating the different interpretations exhibited by teachers.

The data-base of writing output populating the three categories of writing environment has subsequently enabled exploration of relationships between transcription and text generation as in the not-so-simple view of writing (Berninger & Winn, 2006) in studies 3-7.

7 Study 3 HANDWRITING AND SPELLING CHARACTERISTICS OF WRITTEN OUTPUT

7.1 Introduction

Transcription is a fundamental element of writing since it enables information to be recorded, stored, organised and then demonstrated. However, despite the importance of handwriting and spelling, comparatively little is known about day-to-day transcription in primary school classrooms, both across the curriculum and in dedicated handwriting and spelling tuition. In consequence, Study 2 was designed to describe activities carried out in T-gen, T+C-gen, and C-gen writing environments, and Study 3 built on Study 2 by estimating the amounts written by children, along with spelling error rates in each of these environments.

Graham and Harris (2017) and others have recommended that children should write ‘more’ in order to increase opportunities for practice of both lower- and higher-level writing skills in order to improve compositional quality. There is, however, minimal information about how much is actually occurring. Furthermore, since amount written is measured in terms of duration of classroom sessions, no account has been taken of variation between children within classes. There are also no recommendations in the NC about how much writing should occur in the classroom. The amount carried out is consequently determined by teachers and school policies and the study 1 interviews suggested that beliefs about appropriate levels of production varied between teachers. Overall, inconsistency in output, both between children and between classes is highly likely. It would be valuable to be able to compare the relative importance of inter-child and inter-class variation. Should the findings of the current study be consistent with results

from future research, there would be potential policy implications, for example approximate goals for amount of handwritten output over a given period and support and/or differentiation for children experiencing writing difficulties.

Spelling instruction in UK primary schools is based in synthetic phonics, augmented by knowledge of factors such as morphology. The content of required spelling instruction is provided in some detail in the NC but there is little guidance given about the format of written practice. Multiple-resources theories of spelling acquisition imply that learning through experience of spelling while writing in context is essential, but opportunity for this spelling production experience is necessarily limited by the amount of writing taking place.

Study 2 defined and described writing environments at schools. The meta-analysis findings discussed in chapter 2 showed that explicit instruction is effective in promoting knowledge acquisition, whether writing-specific or associated with cross-curriculum content. However, as discussed in Study 2, little is known about the comparative effectiveness of activities carried out in different writing environments, for example copying (the majority of T-gen writing), or children taking notes from material supplied by teachers (T+C-gen writing), and no previous studies have investigated the inter-class variations in the amount of writing taking place or spelling accuracy in each writing environments. This is important if capacity to internalize word meanings into long-term memory differs between the environments

In addition, there has been minimal consideration of spelling challenges in different cross-curriculum writing activities. For example, when copying lesson content from a whiteboard, children are presented with vocabulary, some likely to be unfamiliar, and the copying may be carried out under time pressure – as shown in Studies 2 and 3. In contrast, in explicit instruction unfamiliar words are likely to have been discussed and also articulated by the teacher which provides a source of phonological knowledge, and since

children are required to generate sentences using this unfamiliar vocabulary, at least some comprehension of meaning is necessary. There may be variation in spelling error percentages between the writing environments. Furthermore, if the main priority when copying is maximisation of copying speed and word meanings might not be understood, processing may be shallower and less likely to result in storage in long-term memory. In terms of other purposes for copying, as shown in Study 2, there was little evidence of copying practice dedicated to promoting handwriting speed/fluency or learning spellings through copying.

Berninger and Winn (2006) emphasised that handwriting and spelling compete for the limited reserve of working memory available for writing. Nonetheless, Graham et al. (1997) reported positive correlations between handwriting fluency and spelling accuracy (children aged 6-9, range: .20 - .58; children aged 9-12, range: .16 - .33) implying that children's spelling knowledge may augment handwriting skills and vice versa. Wicki, Hurschler Lichtsteiner, Saxer Geiger, and Müller (2014) (10-11 years) demonstrated that handwriting automation is positively associated with spelling accuracy. Pontart et al. (2013) (6-15 years) had similar findings. However, no investigations into relationships between handwriting skills and spelling accuracy in the entire of typical school work have previously been published. The environmental validity of the current study probes justifiability of generalisation of experimental or intervention studies.

Aim

The aim of Study 3 was to compare the amount written by children in eight Year 5 classes and their spelling accuracy in the three classroom writing environments described in Study 2 (T-gen, T+C-gen and C-gen), and to investigate associations between handwriting and spelling performance.

Objectives

(1) To compare amount of handwriting carried out between children, between classes and between writing environments.

- (2) To compare spelling error rates between children, between classes and between writing environments.
- (3) To investigate links between handwriting output and spelling error rate in each writing environment.
- (4) To compare findings with the results of studies 1 and 2.

7.2 Method

See Chapter 5, method studies 2-7.

7.2.1 Participants

Writing samples from 94 children including 46 boys (mean age =10.20 years, SD = .25, range 9.67-10.75) and 48 girls (mean age =10.14 years, SD = .33, range 9.50-10.75) were analysed. Of these, there were 14 boys and eight girls with FSM/EAL/SEN. Although the children without FSM/EAL/SEN were of principal interest, some analyses were also carried out for those with FSM/EAL/SEN since they gave insight into the range of transcription capabilities which teachers encounter. Children with missing data were excluded since the proportion of their cross-curriculum writing which had been measured was unknown.

7.2.2 Data

7.2.2.1 Letter-counts and spelling error rates

Total number of letters written by each child was calculated from the transcripts of photographed work. The letter count includes letters which were erased from the final draft. Words misspelled in the final draft were identified and percentage error-rate computed. This simple measure was appropriate since analysis of error-types was not carried out in this study.

7.2.3 Analysis

Non-parametric tests were used throughout since the data did not follow normal distributions. Bonferroni corrections were used when appropriate. A significance level of $p < .05$ was adopted.

Mean number of letters written (letter-count) were calculated for all children and, when specified, separately for those with or without FSM/EAL/SEN. Gender differences were compared using Mann-Whitney tests. Associations between age and mean letter-counts were investigated using Spearman correlations.

Inter-class comparisons were calculated for mean total letter-count, using Kruskal-Wallis tests and post-hoc Mann-Whitney U tests. Subsequently, mean letter-counts were compared between the three writing environment categories (T-gen, T+C-gen, and C-gen), using Friedman tests and post-hoc Wilcoxon signed-rank tests. Finally, inter-class comparisons were carried out for mean letter-counts within each writing environment category, using Kruskal-Wallis tests and post-hoc Mann-Whitney U tests.

The same procedures were carried out for spelling error percentages. Associations between letter-counts and spelling error percentages were calculated using Spearman tests.

7.3 Results

The results are in three main sections. The first is associated with letter-count and the second with spelling error percentage. In both, data is shown at child-level, class-level, writing environment-level, and finally class- and writing environment-levels combined. The third section relates to the relationship between letter-counts and spelling error percentages.

7.3.1 Letter-counts

7.3.1.1 Child-level

The mean letter-count for all children was 2474.56 (SD: 1512.39; min 426, max 6949). For children without FSM/EAL/SEN the mean value was 2768.56 (SD: 1537.48; min 703, max 6949). The ratios between highest and lowest letter-counts were 16.31:1 (all children) and 9.88:1 (children without FSM/EAL/SEN).

Gender: Mann-Whitney tests demonstrated that for all children, and for children with or without FSM/EAL/SEN, there were no significant gender differences between letter-counts ($p > .405$). Nonetheless, despite the lack of significant differences, ranges of scores for boys exceeded those for girls in all cases (see table 37).

Table 37 Mean letter-counts: gender comparison

	N	Mean letter-count	SD	min	max
All boys	53	2511.91	1643.04	426	6949
All girls	48	2433.33	1369.89	881	6729
Boys without FSM/EAL/SEN	39	2956.00	1657.99	703	6949
Girls without FSM/EAL/SEN	40	2585.80	1407.07	915	6729
Boys with FSM/EAL/SEN	14	1274.79	723.30	426	3107
Girls with FSM/EAL/SEN	8	1671.00	878.89	881	3178

Age: Spearman correlations were calculated for letter-counts and age for all children, and for children with or without FSM/EAL/SEN. None were significant ($p > .365$).

7.3.1.2 Class-level

Mean values for numbers of letters written in each class were calculated (see table 38). Class 4 had the highest mean letter-count (5210.67) and class 1 the lowest (1147.70). The ratio in letter-counts between the most and least productive classes was 4.54:1.

Table 38 Mean letter-counts in each class

Class	All children	Mean number of letters written	SD	Min	Max
1	10	1147.70	438.92	426	1934
2	13	1488.62	423.88	944	2256
3	17	2723.65	1366.27	597	5708
4	12	5210.67	1129.48	3080	6949
5	19	2322.37	680.86	1108	4018
6	8	1385.50	420.31	809	1931
7	11	3471.91	1136.61	2253	6498
8	11	1533.82	818.89	703	3676
Total	101				

Figure 5 shows the distribution of numbers of letters written in each class. In addition, an estimate of the numbers of words associated with the letter-counts is included:

$$\text{Number of words written} = \frac{\text{mean number of letters written}}{\text{mean word length for all children}}$$

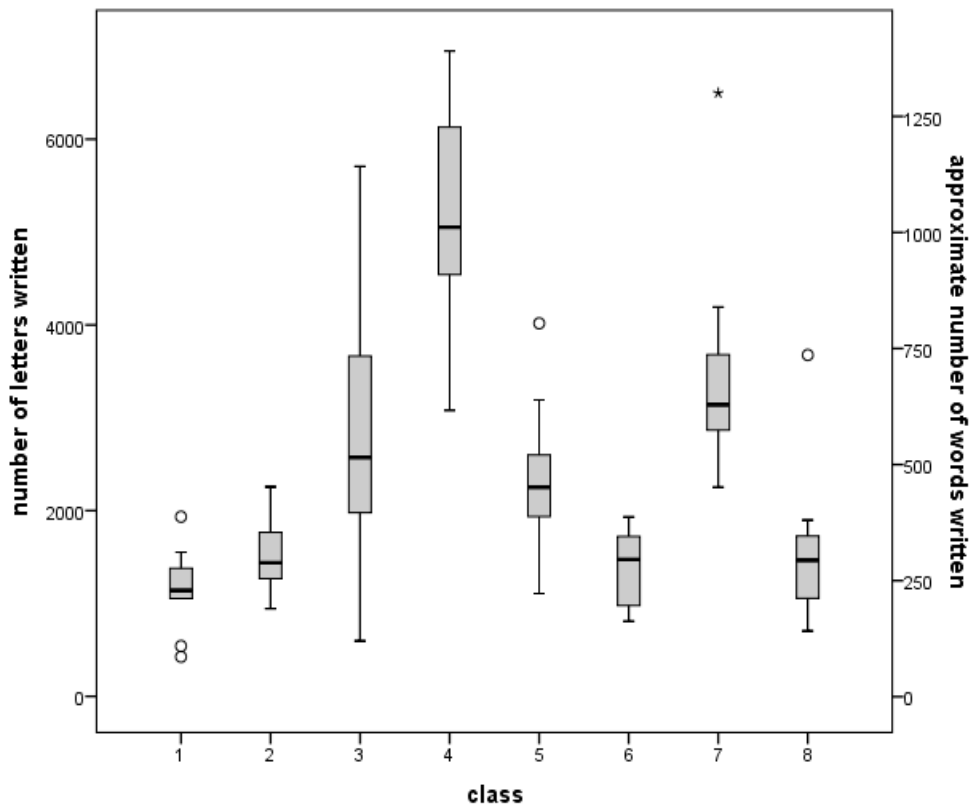


Figure 5 Boxplot showing the numbers of letters written by children in each class

A Kruskal-Wallis test was carried out to investigate letter-count differences between the eight participating classes. Statistically significant differences between classes were found for all children ($H(7) = 56.78, p < .001$). Post-hoc Mann-Whitney U tests with the Bonferroni correction ($p < .002$) were carried out for all children. They showed that the mean letter-count for children in class 4 was greater than that for any of the other 7 classes. The mean letter-count in class 7 was less than that in class 4 but greater than in any other class. The mean letter-count for class 5 was less than in classes 4 and 7, and greater than classes 1 and 2. The mean letter-count for class 3 was less than that in class 4. There were no significant differences between the four lower-output classes (1, 2, 6 and 8).

7.3.1.3 Writing environments

The mean letter-counts in T+C-gen writing and C-gen writing were similar and more than twice the mean letter-count in T-gen writing (17% T-gen, 40% T+C-gen, 43% C-gen (see figure 6).

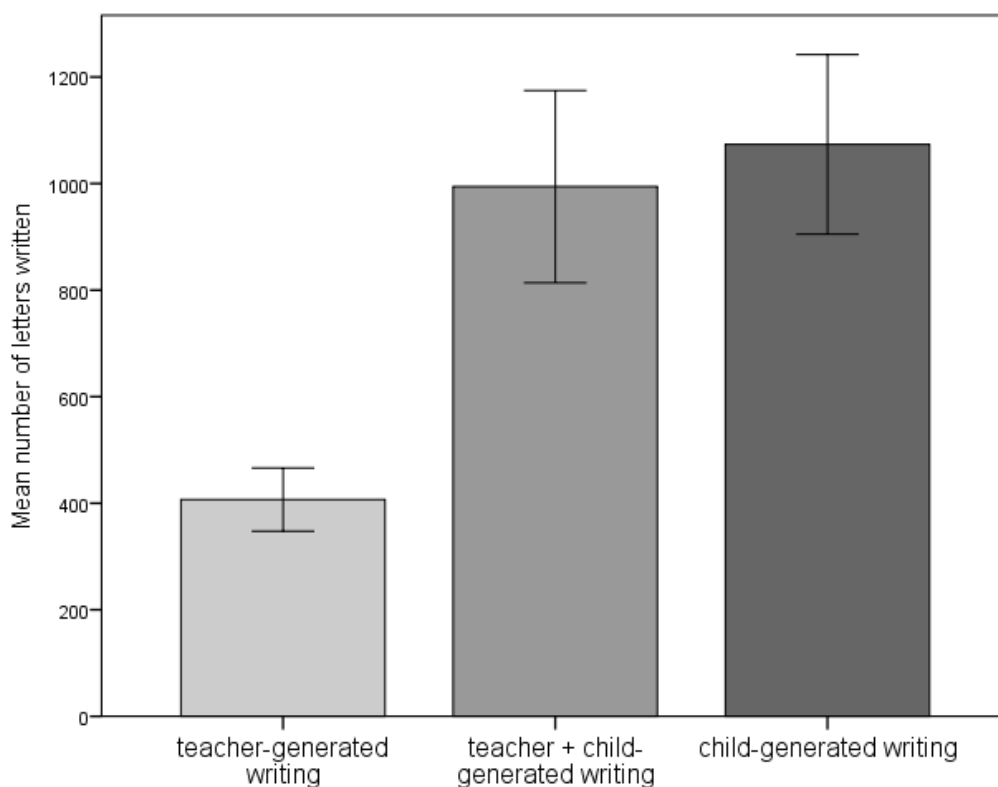


Figure 6 Mean number of letters written in T-gen, T+C-gen, and C-gen writing

(Error bars: 95% CI)

A Friedman Test demonstrated a significant difference between mean letter-count in T-gen writing, T+C-gen writing and C-gen writing ($\chi^2(2) = 27.84$, $p < 0.001$) for all children. Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction ($p < .017$). The mean letter-counts differed significantly between T-gen writing vs T+C-gen writing ($Z = -6.35$, $p < 0.001$) and T-gen writing vs C-gen writing ($Z = -6.60$, $p < 0.001$). The difference between mean letter-counts in T+C-gen writing and C-gen writing was not significant ($p = .403$).

T-gen writing letter-count, class comparison

T-gen work included headings, lesson content, and handwriting and spelling practice. A Kruskal-Wallis test was carried out to investigate output variation between participating classes. Statistically significant differences were found ($H(7) = 68.45, p < .001$). Post-hoc Mann-Whitney U tests using the Bonferroni correction ($p < .002$) showed that the mean T-gen letter-count in classes 2 and 4 was significantly greater than in classes 1, 3, 5, and 7. Class 8 mean T-gen letter-count was significantly greater than in classes 3, 5, and 7. Class 1 mean T-gen letter-count was significantly greater than in class 3. Class 1, 5 and 6 mean T-gen letter-counts were significantly greater than in class 7. No other differences were significant ($p \geq .003$).

T+C-gen writing letter-count, class comparison

T+C-gen work included explicit teaching and question and answer activities. A Kruskal-Wallis test was carried out to investigate output variation between classes. Statistically significant differences were found ($H(7) = 70.91, p < .001$). Post-hoc Mann-Whitney U tests using the Bonferroni correction ($p < .002$) showed that mean T+C-gen letter-counts in classes 4 and 7 was significantly greater than in classes 1, 2, 3, 5, 6 and 8. Class 5 T+C-gen mean letter-count was significantly greater than in classes 2 and 8. Class 6 T+C-gen mean letter-count was significantly greater than in class 2. No other differences were significant ($p \geq .004$).

C-gen writing letter-count, class comparison

C-gen work included word-level, sentence-level, discourse-level writing. A Kruskal-Wallis test was carried out to investigate output variation between classes. Statistically significant differences were found ($H(7) = 52.80, p < .001$). Post-hoc Mann-Whitney U tests using the Bonferroni correction ($p < .002$) showed that the C-gen letter-count in class 4 was significantly greater than in class 1, 2, 6 and 8. Class 5 and 7 C-gen letter-counts were significantly greater than in class 1, 2 and 6. No other differences were significant ($p \geq .003$).

Overall, for both T+C-gen and C-gen writing, letter counts were greater in classes 5, 3, 7 and 4 (in which total letter counts were comparatively high) than in classes 1, 6, 2, and 8 (low total output classes). This pattern was not evident in T-gen writing.

7.3.1.4 Letter-count across classes and writing environment categories

Figure 7 shows the proportions of letters written in the three categories of writing for each class. It indicates that in classes with lower overall letter-counts, 32-40% of writing was T-gen (classes 1, 2, 6 and 8). In contrast, in higher productivity classes, 4-18% of the writing was T-gen.

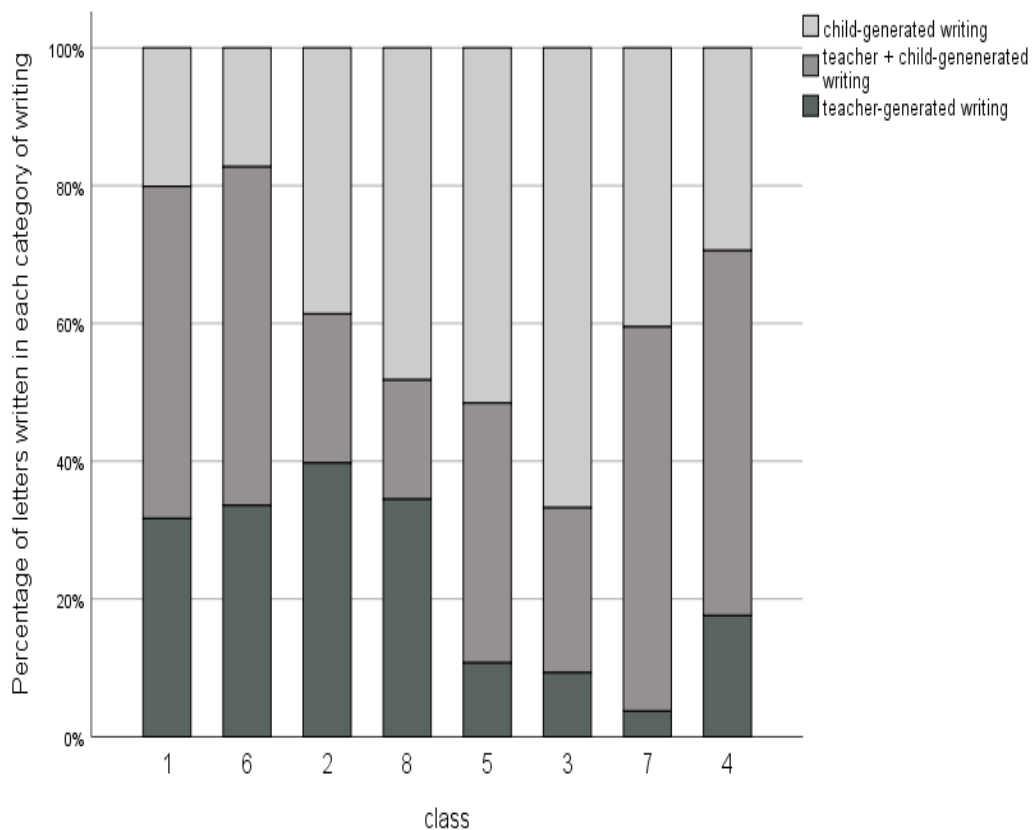


Figure 7 Comparison of proportion of letters written in T-gen, T+C-gen, and C-gen writing in each class

7.3.2 Spelling error percentages

7.3.2.1 Child-level

Mean spelling error percentages were calculated for all children. In addition, error rates were calculated for children with and without FSM/EAL/SEN since children with dyslexia and various other specific learning difficulties and those who use EAL are likely to have greater spelling error difficulties than their peers.

The mean error percentage for all children was 8.60 (SD: 5.55; min 0.6, max 29.2). The mean for children without FSM/EAL/SEN was 7.67 (SD: 5.10; min 0.6, max 29.2). For those with FSM/EAL/SEN it was 11.94 (SD: 5.93; min 3.2, max 22.0), showing that children with FSM/EAL/SEN had a higher overall spelling error percentage than those without.

Gender: Mann-Whitney tests demonstrated that for all children, and for children with or without FSM/EAL/SEN, there were no significant gender differences between spelling error percentage ($p > .244$). Nonetheless, ranges of scores for boys exceeded those for girls in all cases (see table 39).

Table 39 Mean spelling error percentages, gender comparison

	N	Mean spelling error %	SD	min	max
All boys	53	9.51	6.28	0.6	29.2
All girls	48	7.60	4.46	0.9	20.0
Boys without FSM/EAL/SEN	39	8.16	5.83	0.6	29.2
Girls without FSM/EAL/SEN	40	7.20	4.28	0.9	20.0
Boys with FSM/EAL/SEN	14	13.29	6.14	3.2	22.0
Girls with FSM/EAL/SEN	8	9.58	5.04	4.3	17.0

Age: Spearman associations were calculated for spelling error percentage and age for all children, and for children with or without FSM/EAL/SEN. None were significant ($p > .100$).

7.3.2.2 Class-level

Mean values for spelling error percentage in each class were compared (see table 40 and figure 8).

Table 40 Comparison of mean spelling error percentages in each class

Class	All children	Mean spelling error %	SD	Min	Max
1	10	10.49	6.47	3.0	21.8
2	13	11.42	8.36	2.8	29.2
3	17	9.49	4.17	3.5	17.2
4	12	5.68	2.56	2.0	9.3
5	19	8.06	5.10	2.1	19.0
6	8	6.98	5.68	1.6	18.8
7	11	7.37	4.99	0.9	20.0
8	11	8.74	5.22	0.6	19.4
Total	101				

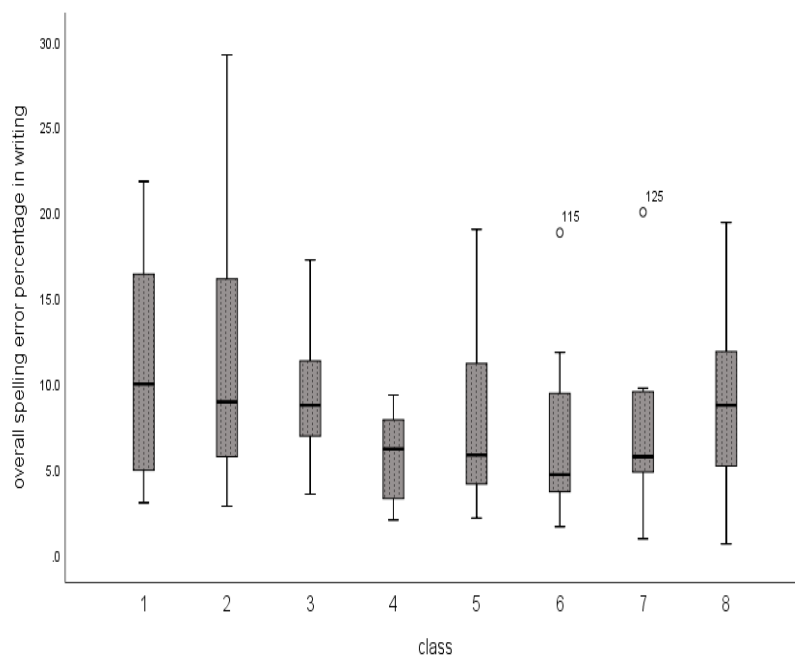


Figure 8 Boxplot of spelling error percentages made by children in each class

Class 2 had the highest mean spelling error percentage and class 4 the lowest. However, a Kruskal-Wallis test indicated that the difference between classes was non-significant ($p = .267$).

7.3.2.3 Writing environment

Spelling error percentages were compared across categories (see figure 9) since error rates may be a product of writing environment.

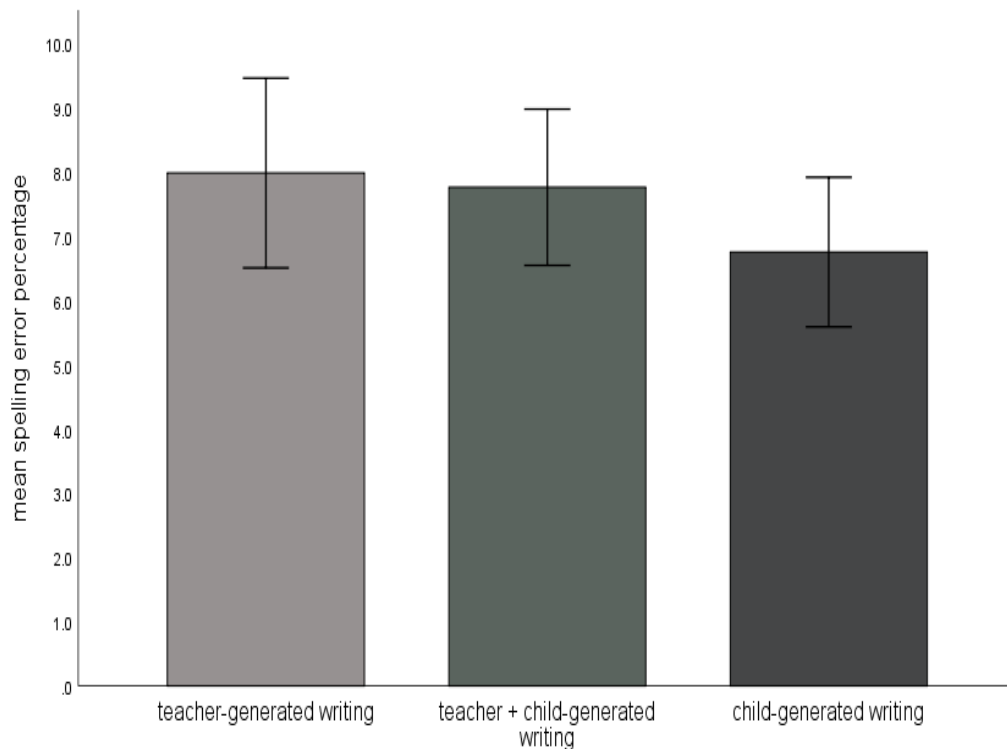


Figure 9 Mean spelling error percentages in T-gen, T+C-gen, and C-gen writing
(Error bars: 95% CI)

The mean error rate in T-gen and T+C-gen writing were similar, but it was lower for C-gen writing.

Friedman Tests showed that the difference between error rates in the three categories of writing was non-significant either for all children ($p = .074$) or for children with FSM/EAL/SEN ($p = .247$). For children without

FSM/EAL/SEN there was a significant difference in error rate ($\chi^2(2) = 7.535, p = 0.023$). Post hoc analysis using Wilcoxon signed-rank tests with a Bonferroni correction ($p < .017$) indicated that while there were no significant differences between the T-gen and T+C-gen writing ($p = 0.262$) or T-gen and C-gen writing for children ($p = 0.077$), error rate in C-gen writing was significantly lower than in T+C-gen writing ($Z = -2.45, p = 0.014$).

T-gen writing spelling error percentage, class comparisons

A Kruskal-Wallis test showed that there was no significant difference ($p = .190$).

T+C-gen writing spelling error percentage, class comparisons

A Kruskal-Wallis test showed that there was no significant difference ($p = .092$).

C-gen writing spelling error percentage, class comparisons

A Kruskal-Wallis test was carried out to investigate differences in spelling accuracy. Differences between classes were significant overall ($H(7) = 25.98, p = .001$). Post-hoc Mann-Whitney U tests using the Bonferroni correction ($p < .002$) showed that spelling error rate was significantly higher in class 3 than in classes 4 and 6. No other differences were significant ($p \geq .003$).

7.3.2.4 Spelling error rates across classes and writing environments

Figure 10 summarises percentage spelling error rates in the categories of writing across classes. It shows that the ratios between rates in the three categories of writing varied between classes, although there was no observable trend between the ratios of spelling error percentage between classes and total spelling error percentage.

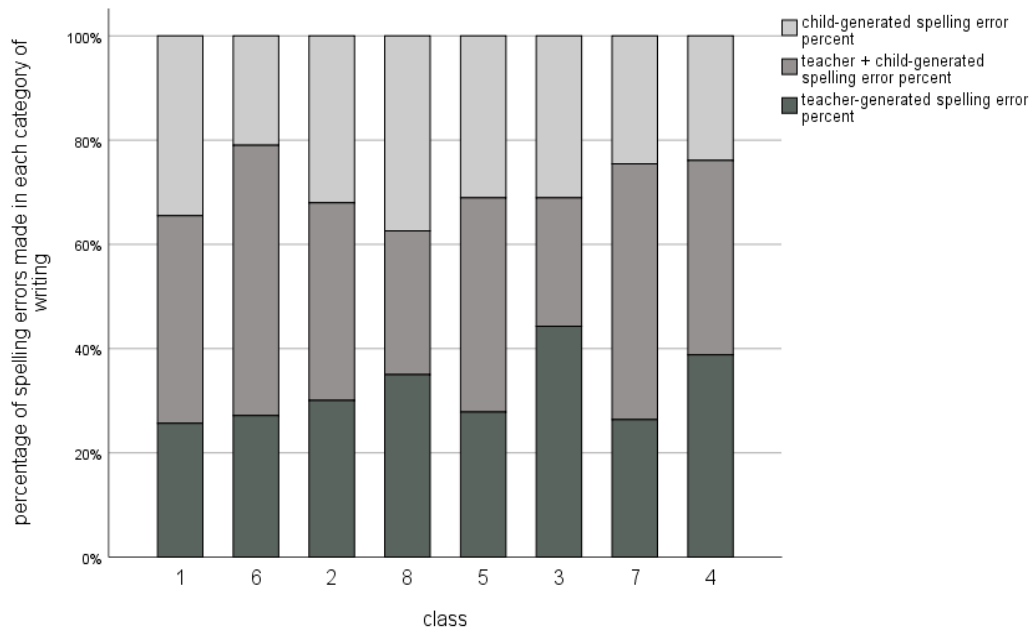


Figure 10 Spelling error rates in each category of writing by class

7.3.3 Associations between handwriting and spelling

For all children, there was a weak negative correlation between total letter-count and spelling error percentage ($\rho = -.243, p = .015$). Children with and without FSM/EAL/SEN differed. There was a moderate negative correlation for those with FSM/EAL/SEN ($\rho = -.452, p = .035$) whereas the correlation for those without was non-significant ($p = .326$). This result indicates that for children with FSM/EAL/SEN, those whose letter-count was lower tended to have a higher proportion of spelling errors in their writing.

7.4 Discussion

Key findings

This study investigated classroom transcription written over a period of one week, quantified as numbers of letters written (a measure of cross-curriculum handwriting production) and spelling error percentage. The principal finding for amount written was considerable variability in letter-count across individual children. The most productive child wrote 16 times more letters than the least. In addition, children with FSM/EAL/SEN wrote

only half the number of letters than those without. There was also a large difference between classes; mean child letter-count in the highest productivity class was nearly five times greater than in the lowest. In addition, higher productivity classes had completed a greater proportion of their writing in the T+C-gen and C-gen writing environments than the lower productivity classes.

Spelling errors between writing categories were also examined and differed between children with FSM/EAL/SEN and children without. For those without FSM/EAL/SEN, spelling error rate was lower in C-gen writing than in either T+C-gen or T-gen writing. In contrast, there was no significant difference for children with FSM/EAL/SEN. Also, children without FSM/EAL/SEN who spelled more accurately in one category of writing also tended to have lower error rates in the other categories, a consistency not evident amongst those with FSM/EAL/SEN. There was no link between letter-count and spelling error rates for those without FSM/EAL/SEN, but children with FSM/EAL/SEN who had lower letter-counts had higher spelling error percentages.

Unexpectedly there were no gender or age effects on letter-count or spelling accuracy. This was the case for all children including those with or without FSM/EAL/SEN. There were, nevertheless, gender differences in the form of greater score ranges for boys.

7.4.1 Letter-counts

The range of individual child letter-counts was striking. While this may reflect individual differences between children, there were also interclass differences. Even when children with FSM/EAL/SEN (who wrote approximately half the number of letters than their peers) were excluded from the analysis there was still a ten-fold difference between the most and least productive children. The class mean letter-count differences were also considerable. Almost all pupils in classes 1, 2, 6 and 8 had lower letter-

counts than even the least productive children in classes 4 and 7. Children in classes 1, 2, 6 and 8 therefore had a more limited experience of written text generation during the data collection week.

The teachers of classes 3, 4 and 7, in which letter-counts were higher, timetabled regular extended writing opportunities, as discussed in Study 1. In addition, teachers in these classes either promoted handwriting speed, specified amounts of writing expected before tasks have been embarked upon, or monitored amounts which had been written. Guadagnoli and Lee (2004) and Schmidt (1975) emphasised that practice was the important factor in establishing motor skills and children in the remainder of the classes are likely to have had less practice.

Approximately one fifth of total letter-count was attributable to T-gen writing (principally copying). However, in the four lower productivity classes T-gen letter-count constituted approximately one third of the total whereas the equivalent figure for higher productivity classes was one twelfth. Many teachers commented in their interviews that little copying took place in their classes. Letter-count evidence demonstrated that this was not generally the case and in fact a significant proportion of writing carried out in lower productivity classes took the form of copying.

Study 2 indicated that headings were used in all classes and it was unusual for any work not to be preceded by one. The headings were often in the form of sentences defining lesson objectives and/or lists of required elements. For example (spelling errors in rounded brackets):

- *I can write a non-chronological report. I [the teacher] expect: Sub-heading, introduction, person, glossary, Technical language, Facts, (expertise)*
- *I can represent data in a graph or charts. I can explain why I chose this (particular) one.*
- *I can write an (advertisement) using, persuasive devices.*

Children may therefore have written similar numbers of copied headings in different classes, but the amount of subsequent lesson content (usually in the form of T+C-gen or C-gen writing) varied.

As suggested in Study 2, the three categories of writing may well present dissimilar cognitive challenges. Should this be the case there are possible ramifications in terms of teaching effectiveness, owing to the respective magnitude of cumulative demands on working memory. Copying is cognitively demanding (Laishley et al., 2015) whereas in explicit teaching (the majority of T+C-gen writing) there is step-by-step learning with ongoing monitoring of comprehension (Archer & Hughes, 2011). If copying represents a significant proportion of written work in a given class there may be a negative effect on net vocabulary acquisition due to shallower processing of meaning resulting from the cognitive demands of copying. A consequence is unfinished class work (Montgomery, 2008; Roaf, 1998) and, again, reduced vocabulary acquisition.

7.4.2 Spelling error percentages

The ratio between highest and lowest spelling error percentage amongst children was 50:1 and mean spelling error rates between classes differed by a factor of 2 to 1. Unlike letter-counts, there was no significant difference in spelling accuracy between individual classes in each of the categories of writing environment.

Spelling accuracy findings are more difficult to interpret than letter-counts. The writing tasks completed by children in different classes are likely to have had differing spelling challenges related to genre or topic. For example, children in one class wrote a newspaper report about a football match, whereas those in a different class wrote a non-chronological report about a Greek mythical beast. There may also be individual differences in vocabulary choice related to spelling confidence; Sumner, Connelly, and Barnett (2016) found that children with dyslexia had higher lexical diversity

in verbal than written compositions, and word selection was associated with spelling ability and not oral vocabulary; children may spell more accurately because they tend to select words which they are more confident of spelling correctly.

Children with FSM/EAL/SEN had a higher overall mean spelling error rates than those without. This notwithstanding, many without FSM/EAL/SEN also spelled inaccurately. While some of these children will have been within the normal range of spelling capability, others may have had undiagnosed specific learning difficulties. This may in part reflect policy differences between schools associated with specific learning difficulties assessments.

It is for individual schools to decide the procedures they should adopt for meeting the needs of all children, for observing and assessing their progress, and for deciding the nature of the special educational provision that they should make.

(DfES, 2001, p. 51)

Interpretation of differences between children with and without SEN is consequently problematic as a given child could be described as having dyslexia at one school but not at another.

7.4.3 Associations between letter-count and spelling error percentage

Handwriting and spelling use a common but limited resource of working memory. Although handwriting and spelling skills develop in parallel throughout primary education, they involve some separate skills and capabilities. For example, children with dyslexia with well-developed coordination skills may have comparatively rapid and accurate handwriting but are likely to have spelling difficulties. Conversely, children with developmental coordination disorder may spell accurately but have difficulty executing the spellings in written language. This illustrates the cognitive differences between handwriting, which combines perceptive,

motor, cognitive and linguistic skills which depends on information derived from elements such as phonology, orthography, morphology and etymology. Nonetheless, at primary school most spelling occurs through the medium of handwriting, both exert considerable demands until they are automatized, and they draw on the same resource of working memory. In consequence, performance in spelling or handwriting is to some extent interdependent until the combined cognitive load no longer exceeds cognitive capacity

This is consistent with the findings in this study for children without FSM/EAL/SEN. For them there was no correlation between letter-count and spelling error rate for children without FSM/EAL/SEN. By the age of 9-10 years, these children may be following independent trajectories in handwriting and spelling development. For example, a child may have well-developed handwriting skills, a product of sufficient practice and well-matured distal motor control, but still lack spelling knowledge. There is recent evidence suggesting this increasing independence of spelling and handwriting throughout development as described by Bosga-Stork, Bosga, & Meulenbroek (2014) (7-9 years, Dutch) and Afonso et al.(2018) (7-12 years, Spanish).

In contrast, there was a significant correlation between letter-counts and spelling error rates for children with FSM/EAL/SEN: those whose spelling was less accurate tended to have lower letter-counts. As described by Kandel and colleagues, the effects of central processing of spelling cascade down into motor execution. Should this result in cognitive overload, performance is likely to suffer. The analysis in this study does not show whether skill in either handwriting or spelling predicts performance in the other. It does suggest that performance in both is restricted when there is a lack of automatization.

There may also be motivational factors. If there is a history of handwriting and/or spelling difficulties, children may have become less motivated to undertake writing. There is consequently less accumulated practice in

transcription, a greater probability of cognitive overload, and a likely consequence is a lower-letter count and a greater spelling error percentage. Several participants in Study 1 commented that children's writing feedback from teachers may be heavily slanted towards handwriting and spelling problems rather than creativity which may result in discouragement

Overall, the findings for these two groups of children reflect Graham et al. (1997) who showed that alphabet test results (estimating handwriting automaticity) were moderately positively correlated with spelling accuracy for children aged 6-9, whereas the correlation for children aged 9-12 was weak.

7.4.4 Gender and age

Medwell and Wray (2014) found that boys in Year 6 (10-11 years) wrote significantly fewer letters in the alphabet writing task than girls. Similarly, girls aged 7-19 years outperformed boys in spelling (Reynolds, Scheiber, Hajovsky, Schwartz, & Kaufman, 2015). Unexpectedly gender did not appear to be linked with transcription scores in the current study; the measures used may have been insufficiently sensitive to detect gender differences in a deliberately homogeneous sample of schools (see chapter 5 – Method). Nonetheless, the ranges between highest and lowest letter-count and spelling accuracy in this study were considerably larger for boys than girls, with a longer tail at the lower end of the male distributions. The distribution may reflect the higher proportion of boys than girls with SEN nationally (also evident in the participants in this project).

Findings related to age were similarly unexpected with a lack of increased letter-count for older children. This may be a function of the limited age range, i.e. within one Year group. Also, although there is converging evidence that distal motor skills are insufficiently well-developed to allow automatization of writing until the end of primary school for most children (Chartrel & Vinter, 2006; Palmis et al., 2017), the variability in age when

there maturation effects have become evident may have masked the expected age effect. An additional reason for the nonsignificant age effect is children being encouraged or choosing to focus on neatness and presentation rather than amount of output. Several of the Study 1 class teachers emphasised presentation and children's 'pride in their work'. However, as handwriting skills approach automaticity, increase in speed (and consequently likelihood of larger letter-count) and emphasis on neatness are not compatible. Accuracy, is reliant on feedback control but there is a maximum speed for feedback control (Teulings, 1996). In contrast, increase in speed depends on feedforward rather than feedback motor control. The consequence is that while older children may have the capacity to write letters and joins with more accurately this may not result in greater letter counts. Had the alphabet test for orthographic/motor integration been carried out, in which participants are asked to write legible letters as fast as possible, there might have been an age-within-the-school-year effect.

Similarly if handwriting had been scored as in SATs (accuracy and neatness), the greater motor control skills of older children might have been evident.

7.5 Key points and conclusions

This study investigated real-life transcription at school, using the writing environment categorisation scheme described in Study 2. There was a wide range in numbers of letters written by individual children and between classes during the data collection period. This suggests variations in amount of handwriting carried out across the curriculum and opportunity for spelling practice in context. A possible consequence is that some children's handwriting skills may have less opportunity for development than others, and there is also a possible class effect. A larger proportion of the writing experience of children in lower output classes was T-gen copying than in

high output classes. As copying is cognitively demanding (Laisley et al., 2015) this might have implications for learning capacity in some classes. Lower letter-counts and reduced spelling accuracy were linked for children with FSM/EAL/SEN, suggesting possible cognitive overload. This was not evident for children without FSM/EAL/SEN. Neither age nor gender effects were found.

Studies 4-6 extended the investigation into transcription carried out in this chapter into links between transcription and text-generation.

8 Study 4 LINKS BETWEEN TRANSCRIPTION AND WORD-LEVEL TEXT GENERATION

8.1 Introduction

The previous chapter examined the transcription skills of handwriting and spelling and showed that there was wide inter-child and inter-class variation in the amount written over data collection periods. The current chapter extends this work to consider text generation in writing. Text generation can be considered at several levels and here the focus is on word-level and vocabulary in particular. Transcription data from Study 3 will be drawn upon, along with measures of lexical richness of vocabulary. As in the previous chapter the investigation includes an examination of performance across individual pupils, school classes and also across different writing environments (i.e. teacher-generated (T-gen) writing, teacher + child-generated (T+C-gen) writing and child-generated (C-gen) writing).

It is likely that there is considerable competition for working memory resources if children's handwriting and spelling skills are not yet well developed. However, transcription skills improve as a consequence of practice and there is a reduction in requirement for working memory capacity. In consequence, resources become available for higher-level processing, including text-generation. This has been demonstrated in previous studies which have shown that orthographic-motor integration (i.e. automatization) and copying speed predict compositional quality in discourse-level text generation (Graham et al., 1997; Medwell et al., 2009).

Effects deriving from increases in transcription skill are also likely to be evident in quality of word-level text-generation. The lexical quality hypothesis (LQH: Perfetti, 2007; Perfetti & Hart, 2001, 2002) indicated that

the effectiveness of vocabulary learning is dependent on sufficient orthographic, phonological and semantic knowledge. However, the deep processing required to enable storage of previously unfamiliar vocabulary in long term memory is cognitively demanding. If transcription skills are well-established there is greater likelihood of sufficient working memory resource-availability to enable deep processing. Dobbs and Kearns (2016) commented that only those words which have been stored in long-term memory are available for C-gen writing.

Little is known about the relative benefits of different writing environments in promoting learning, whether of skills or content knowledge. Explicit instruction has been widely demonstrated to be effective, including for word knowledge acquisition (Archer & Hughes, 2011; Graham & Harris, 2017). There have, however, been no comparable analyses concerning, for example, copying and note-taking. Laishley et al. (2015) emphasised the considerable working memory demands evident when children are copying (majority of T-gen writing), potentially exacerbated by inaccurate gaze shifting resulting from immature letter position encoding (Castles et al., 2007). Laishley et al. also found that the processing of longer words was frequently in non-semantic units. These cognitive burdens may constrain word learning.

The NC specifies that children are expected to express meaning through precise choice of words. It is, consequently, necessary for them to have acquired a substantial vocabulary, and Dockrell et al. (2016) showed that teachers emphasised word-level text generation and also spelling in both Key Stage 1 and 2. Specific difficulties with word-level text generation have been implicated in the underperformance of a substantial minority of pupils in writing. Amongst these, boys are over-represented, along with many children with FSM/EAL/SEN (Cameron & Besser, 2004; Sumner et al., 2016; G. J. Williams et al., 2013). In addition, younger children have had a shorter time in which to acquire vocabulary knowledge. However, despite the importance of word knowledge, quality of vocabulary comprises

only one of eight assessment foci in Key Stage 2 writing tests, much greater emphasis being placed on sentence-, paragraph- and discourse-level text generation.

There are additional methods for analysing vocabulary, including estimations of its lexical richness. Olinghouse and Wilson (2013) investigated a series of lexical richness-related predictors of compositional quality in three genres of writing (children aged 10-11). For story telling they found that 9% of the variance in quality was explained by lexical diversity (a function of the proportion of individual word-types against total word-tokens) and maturity (word frequency). While lexical diversity was also a significant predictor for persuasive writing, there were other factors: use of topic-relevant words and register (i.e. Latinate vs. Germanic words). Together these explained 14% of the variance. The greatest proportion of variance was explained in informative writing, in which topic-relevant words and maturity explained 46% of the variance.

Olinghouse and Wilson (2013) found that lexical diversity was the most stable metric across a range of writing genres. However, diversity and numbers of words written were correlated despite using the corrected type-token ratio (CTTR) which takes account of numbers of words written. Since Study 3 identified a tenfold range in numbers of letters written even amongst children without FSM/EAL/SEN, this suggests that CTTR would not be a reliable measure of lexical richness for Study 4. Use of topic-relevant words and register also had significant drawbacks since the data collected was the entirety of everyday school writing, with inevitable variation in sophistication of vocabulary.

The measures of lexical richness which were selected for Study 4 were word frequency and word length. These were chosen because they discriminated between cognitive loads placed on long-term memory (large capacity) and working memory (a limited capacity for which writing skills compete). Frequency effects are considered to represent lexical procedures in spelling (orthographic long-term memory) whereas word length effects are

associated with the sub-lexical route (orthographic working memory) (Bonin et al., 2015). In their investigation of amount of use of academic vocabulary in writing by children aged 9-12 years, Marinelli, Romani, Burnai, and Zoccolotti (2015), McCloskey and Rapp (2017), and Rapp and Dufor (2011) have each demonstrated that different neural substrates support orthographic working memory and orthographic long-term memory.

Olinghouse and Wilson (2013) adopted a binary classification of frequency - whether a word was included in the General Service List (West, 1953) or not. This database is dated and justification for a binary classification (rather than frequency scale) was not provided. Transcription of the participants' writing in the current project demonstrated that the range of vocabulary in child-orientated databases such as the children's printed word database (M. Stuart et al., 2002) is too limited. In consequence, a more recent and larger database: the English Lexicon Project (Balota et al., 2007) was chosen.

Word-length has been investigated in a number of studies of lexical richness (Deno, Marston, & Mirkin, 1982; Gansle et al., 2002). Measurement tends to have been binary i.e. long vs. short which may be insufficiently sensitive. An alternative is syllable-count (e.g. Sumner et al., 2016), but Laishley et al. (2015) found that half of gaze-shifts during copying occurred within rather than between syllables when copying so syllable-counts might have been inappropriate. For the purpose of Study 4, letter-length was chosen since gaze shifts in Laishley et al. appeared mostly to be associated with letters written.

Overall, there is a lack of knowledge about links between variation in amount of everyday handwritten work occurring at school and the lexical richness of vocabulary used, the subject of the current study. This is important since it may impact on compositional quality, a source of concern. While vocabulary usage is a facet of compositional quality, the assessment of lexical richness of vocabulary is not required in statutory assessments

such as Key Stage 2 writing. Furthermore, there is a lack of knowledge about lexical richness of vocabulary in everyday classroom writing, and whether writing environments impact on vocabulary acquisition. This study examined whether the length or frequency of words used in C-gen writing was linked with transcription (measured using letter-count and spelling knowledge) in T-gen or T+C-gen writing and whether this varied across classes or writing environments.

Aim

The main aim of Study 4 was to investigate links between transcription and the quality of word-level text generation. More specifically, the associations between the amount written or accuracy of spelling in T-gen or T+C-gen writing environments and the lexical richness of C-gen writing were examined.

Objectives

- (1) To calculate mean lexical richness values (word length and word frequency) for children, classes and each writing environments.
- (2) To compare lexical richness inter-writing environment, and also inter-class for each writing environment.
- (3) To investigate associations between amount of T-gen or T+C-gen writing and the lexical richness of C-gen writing.
- (4) To investigate associations between spelling error percentages in T-gen or T+C-gen letter-counts and lexical richness of vocabulary C-gen writing.
- (5) To compare the findings with the results of Studies 2 and 3.

8.2 Method

See Chapter 5, method studies 2-7.

8.2.1 Participants

Writing samples from 79 children, including 39 boys (mean age =10.19 years, SD = .27, range 9.67-10.75) and 40 girls (mean age =10.16 years, SD

= .33, range 9.50-10.75) were analysed. Children with FSM/EAL/SEN were excluded since the characteristics of their written vocabulary might differ from children without (e.g. children with SEN may avoid words which are longer and difficult to spell and those using EAL may tend to use higher frequency words). Children with missing data were also excluded since the proportion of their cross-curriculum writing which had been measured was unknown.

8.2.2 Data

8.2.2.1 Word length and frequency

Lexical richness estimates were calculated from the final drafts of C-gen writing. Mean word lengths (number of letters) and frequencies were obtained using the English Lexicon Project database (Balota et al., 2007). Word frequencies were expressed as log values, since the range of values in log frequencies (1-17) was easier to interpret than non-log values (1-23,100,000).

Table 41 shows the log frequency values for words specified in the current NC Year 5-6 word list along with four commonly used words (including ‘the’ – the highest frequency word in English). All vocabulary listed here was used by children participating in this project:

Table 41 Word frequencies in vocabulary selected by participating children

Words specified for Year 5	Log frequency	High frequency words	Log frequency
mischievous	5.71	because	13.13
exaggerate	6.17	but	14.57
persuade	7.81	that	15.48
thorough	8.47	the	16.96
ancient	9.81		
develop	10.48		
environment	11.17		
government	12.06		

8.2.3 Analysis

The distribution of data were examined. Non-parametric tests were used since some variables did not follow a normal distribution. Bonferroni corrections were used when appropriate. A significance level of $p < .05$ was adopted.

Mean word length and frequency data were calculated for all children. Gender differences in mean word lengths and word frequencies were compared using Mann-Whitney tests. Associations between age and word lengths or word frequencies were investigated using Spearman correlations.

Mean word length and frequency data were calculated for each class and for each writing environment. Inter writing environment differences in word length and frequency were calculated using a Friedman Test with post-hoc pairwise Wilcoxon Tests with Bonferroni corrections. Subsequently, inter-class comparisons were carried out for mean word length and frequency within each writing environment, using Kruskal-Wallis tests and post-hoc Mann-Whitney U tests.

The relationships between transcription and the lexical richness of child-level word-generation were investigated. Associations between T-gen letter-count and C-gen word length or frequency were calculated using Spearman correlations. Subsequently the same procedures were carried out to investigate associations between T+C-gen letter-count and C-gen word length or frequency. Both calculations were repeated for spelling error percentages.

8.3 Results

The results fall into two main sections. The first includes lexical richness data at child-level, class-level or writing environment-level. The second section concerns the principal aim of this study: the extent to which transcription and word-level text generation are associated.

Word length and frequency

8.3.1.1 Child-level

Mean word length and mean word frequency were calculated for all children and are shown in table 42.

Table 42 Mean word length and log frequency, all writing

	Mean	SD	Min	Max
Word length (letters)	5.29	.26	4.60	5.84
Log word frequency	10.89	.35	10.19	11.58

Gender: Table 43 shows mean word length and log frequency, split by gender.

Table 43 Word length and log frequency for boys and girls

	N	Mean word length	SD	min	max	Mean log word frequency	SD	min	max
Boys	39	5.30	.28	4.60	5.82	10.87	.34	10.27	11.54
Girls	40	5.28	.23	4.87	5.84	10.92	.36	10.19	11.58

A Mann-Whitney test showed that there were no significant gender differences between word length ($p = .538$) or log word frequency ($p = .671$).

Age: There was a weak positive correlation between word length and age ($\rho = .23$, $p = .021$), suggesting that older children tended to use longer

words. The correlation between log word frequency and age was non-significant ($p = .365$).

8.3.1.2 Class-level

Table 44 shows mean word lengths and log frequencies and their ranges for each class, across all writing environments.

Table 44 Mean word lengths and frequencies for all writing in each class

	Class	Number of pupils (total = 79)	Mean	SD	Min	Max
Word length (letters)	1	3	4.94	.26	4.67	5.19
	2	12	5.11	.20	4.85	5.54
	3	11	5.41	.24	5.14	5.82
	4	12	5.50	.08	5.38	5.65
	5	17	5.24	.17	4.87	5.49
	6	8	5.48	.21	5.06	5.65
	7	10	5.26	.17	4.97	5.48
	8	6	5.01	.24	4.60	5.27
Log word frequency	1	3	10.97	.29	10.63	11.15
	2	12	11.25	.24	10.67	11.58
	3	11	10.68	.22	10.19	10.97
	4	12	10.55	.12	10.27	10.73
	5	17	11.21	.17	10.92	11.46
	6	8	10.67	.34	10.33	11.37
	7	10	10.65	.16	10.45	10.90
	8	6	11.16	.24	10.84	11.54

(Results for class 1 may not be representative since there were only 3 participants without FSM/EAL/SEN and missing data.)

Mean word lengths were shorter in classes 1, 2 and 8 transcripts. Mean word frequencies were higher in 1, 2, 5, and 8 transcripts. Words which are shorter and higher frequency imply vocabulary of lower lexical richness.

8.3.1.3 Word length and word frequency in each writing environment

Table 45 shows the mean word lengths and log frequencies and their ranges for the three writing environments.

Table 45 Mean word lengths and frequencies in the three writing environments

		Mean	SD	Min	Max
Word length (letters)	T-gen writing	5.44	.51	4.29	7.07
	T+C-gen writing	5.13	.44	4.16	6.82
	C-gen writing	4.72	.41	3.29	5.61
Log word frequency	T-gen writing	11.12	.60	8.81	12.50
	T+C-gen writing	11.09	.58	9.27	12.21
	C-gen writing	11.58	.55	10.53	13.51

Word length

A Friedman Test showed that there was a statistically significant difference between word lengths in T-gen writing, T+C-gen writing and C-gen writing ($\chi^2(2) = 69.12, p < 0.001$). Post hoc analysis with Wilcoxon signed-rank tests was conducted, with Bonferroni corrections ($p < .017$). There were significant differences between T-gen vs T+C-gen word lengths ($Z = -4.34, p < 0.001$), T-gen vs C-gen word lengths ($Z = -7.15, p < 0.001$) and T+C-gen vs C-gen word lengths ($Z = -5.53, p < 0.001$).

Word frequency

A Friedman Test demonstrated that there was a statistically significant difference in word frequencies between the three writing environments ($\chi^2(2) = 31.01, p < .001$). Post hoc analysis with the Wilcoxon signed-rank tests was conducted with Bonferroni corrections. The difference between T-gen vs T+C-gen log word frequency was non-significant ($p = .369$). There were significant differences between T-gen vs C-gen word frequencies ($Z = -4.45, p < .001$) and T+C-gen vs C-gen word frequencies ($Z = -5.73, p < .001$).

These findings indicate that the vocabulary used in T-gen writing was the most sophisticated (longer words and lower frequencies). Conversely, C-gen writing involved shorter and higher frequency words.

8.3.1.4 Word length and frequency variation across classes and writing environments

Kruskal-Wallis tests with post-hoc Mann-Whitney tests (Bonferroni $p < .002$) were used to calculate class differences in word length and frequency for each writing environment. The data are shown in figures 11 and 12.

Word length

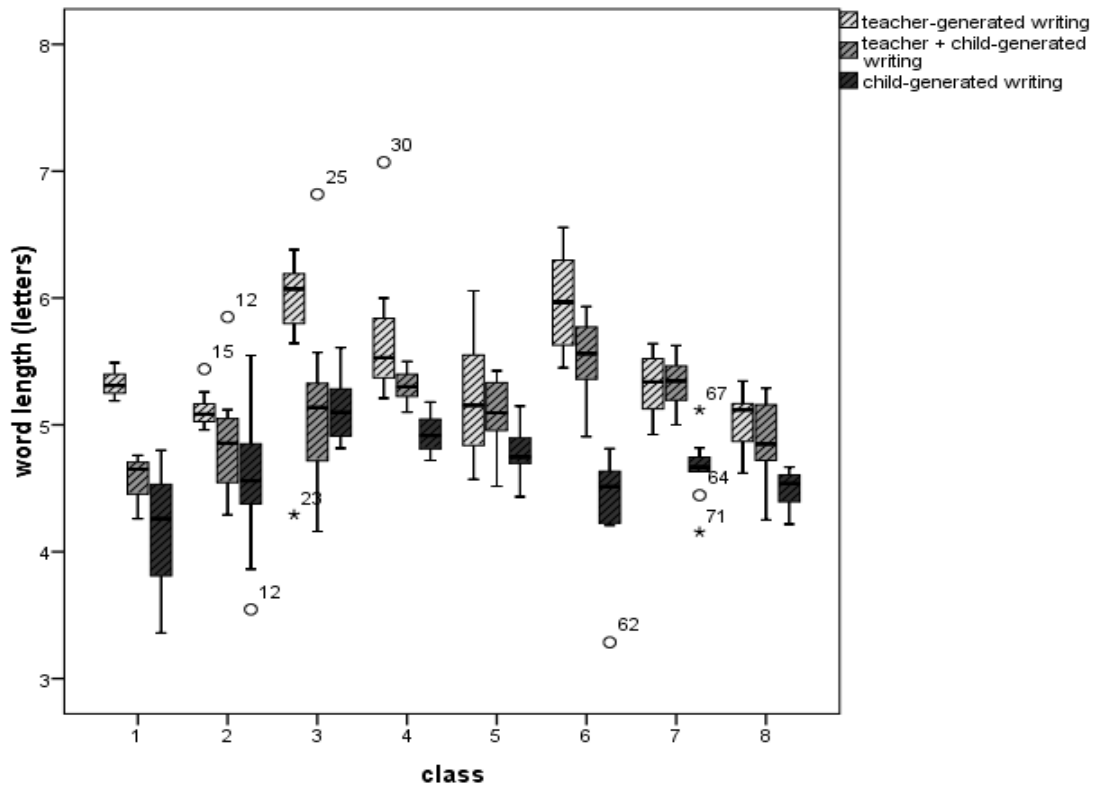


Figure 11 Box plot: inter-class and inter-writing environment variation in word length

T-gen word length: There were significant inter-class differences ($H(7) = 39.08, p < .001$). Mean T-gen word length in class 6 was greater than in classes 2 ($p < .001$), 5 ($p = .001$), 7 ($p = .002$) and 8 ($p = .002$). Mean T-gen word length in class 3 was greater than in classes 2 ($p = .001$), 5 ($p = .001$) and 7 ($p = .002$). Mean word length in class 4 was greater than in classes 2 ($p < .001$) and 8 ($p = .002$). No other differences were significant ($p \geq .007$).

T+C-gen word length: There were significant inter-class differences ($H(7) = 29.393, p < .001$). Mean T+C-gen word length in class 4 was greater than in

class 2 ($p = .001$). Mean T+C-gen word length in class 7 was greater than in class 2 ($p = .002$). No other differences were significant ($p \geq .003$).

C-gen word length: There were significant inter-class differences ($H(7) = 40.242, p < .001$). Mean C-gen word length in class 3 was greater than in classes 5 ($p < .001$), 6 ($p < .001$), 7 ($p = .001$) and 8 ($p = .001$). Mean C-gen word length was greater in class 4 than in classes 6 ($p = .001$) and 8 ($p = .001$). Mean C-gen word length was greater in class 5 than in class 8 ($p = .003$). No other differences were significant ($p \geq .003$).

Word frequency

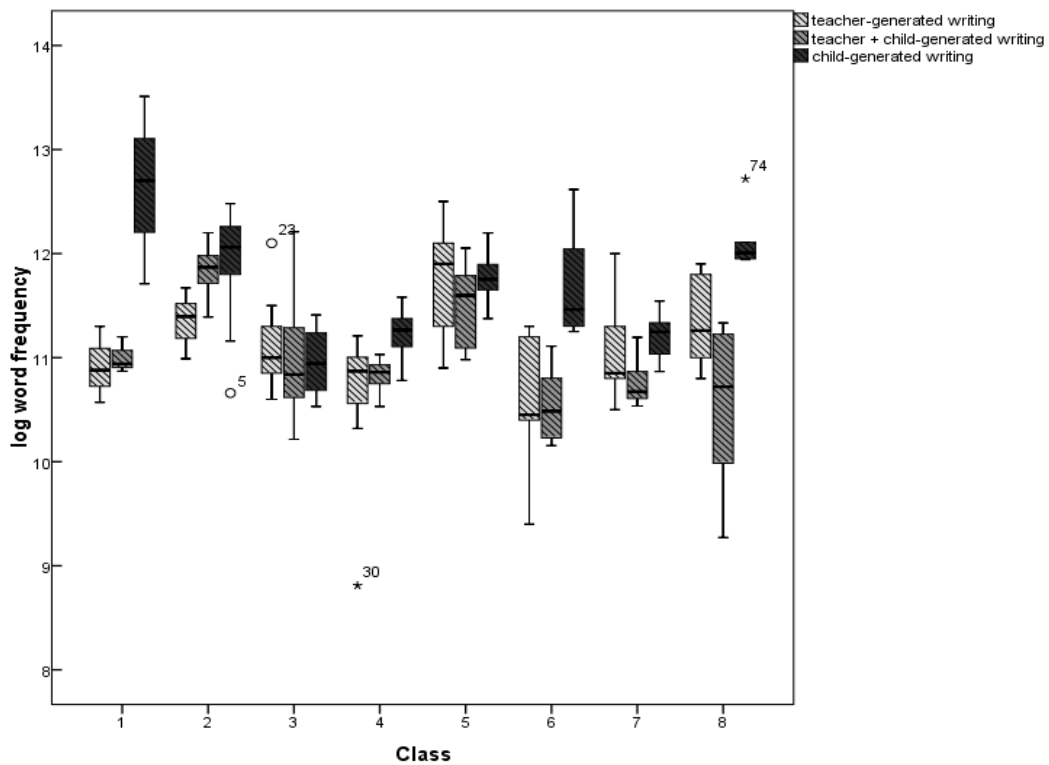


Figure 12 Box plot: inter-class and inter-writing environment variation in word frequency

T-gen word frequency: Significant differences between classes were found ($H(7) = 32.65, p < .001$). Mean T-gen word frequency in class 4 was less than in classes 2 ($p < .001$) and 5 ($p < .001$). In addition, the mean T-gen word frequency in class 6 was less than in class 5 ($p = .001$). No other differences were significant ($p \geq .005$).

T+C-gen word frequency: Significant differences between classes were found ($H(7) = 48.61, p < .001$). Mean T+C-gen word frequency in class 2 was greater than in classes 3 ($p = .001$), 4 ($p < .001$), 6 ($p < .001$), 7 ($p < .001$) and 8 ($p = .001$). The mean word frequency in class 5 was greater than in classes 4 ($p < .001$), 6 ($p < .001$), 7 ($p < .001$) and 8. No other differences were significant ($p \geq .005$).

C-gen word frequency: Significant differences between classes were found ($H(7) = 48.820, p < .001$). Mean C-gen word frequency in class 5 was higher than in classes 3 ($p < .001$), 4 ($p < .001$), and 7 ($p < .001$). Mean C-gen word frequency in class 8 was higher than in classes 3 ($p = .001$), 4 ($p = .001$), and 7 ($p = .001$). In addition, C-gen word frequency in class 2 was higher than in class 3 ($p = .001$). No other differences were significant ($p \geq .003$).

Overall, in classes 3 and 4 mean word lengths were comparatively long *and* word frequencies low (suggesting use of more sophisticated vocabulary) in all three writing environments. In contrast, mean word lengths were relatively short *and* frequencies high for classes 2 and 5.

8.3.2 Associations between transcription and word-level text-generation

Letter count

Spearman correlations with Bonferroni corrections ($p < .017$) were calculated to investigate the associations between letter-counts in T-gen or T+C-gen writing and C-gen lexical richness (word length and frequency). The findings are shown in Table 46.

Table 46 Correlations between C-gen lexical richness and T-gen and T+C-gen letter counts

	T-gen letter-count	T+C-gen letter-count
C-gen word length	non-significant ($p = .700$)	$\rho = .27, p = .017$
C-gen word frequency	non-significant ($p = .076$)	$\rho = -.47, p < .001$

T+C-gen letter-counts were positively associated with C-gen lexical richness. In contrast, correlations between T-gen letter-count and C-gen lexical richness were non-significant.

Spelling accuracy

Spearman correlations with Bonferroni corrections ($p < .017$) were calculated to investigate the associations between spelling accuracy in T-gen or T+C-gen writing and C-gen lexical richness (word length and frequency). The findings are shown in Table 47.

Table 47 Correlations between C-gen lexical richness and T-gen and T+C-gen spelling accuracy

	T-gen spelling accuracy	T+C-gen spelling accuracy
C-gen word length	non-significant ($p = .435$)	non-significant ($p = .088$)
C-gen word frequency	non-significant ($p = .554$)	non-significant ($p = .537$)

Overall, neither C-gen word length nor frequency were significantly associated spelling error percentage in T-gen or T+C-gen writing.

8.4 Discussion

Key findings

This study extended the investigation of transcription in the previous study (Study 3) by examining links between transcription and word-level text generation. The principal aim was to investigate whether transcription in T-gen or T+C-gen writing was linked with the lexical richness of vocabulary in C-gen writing in everyday writing at school. Scores for word length and frequency were calculated and mean values computed for the eight participating classes. Lexical richness in the three writing environments was compared and inter-class variability in lexical richness for each writing environment calculated. Finally correlations were calculated between measures of transcription (letter-counts or spelling accuracy) in T-gen or T+C-gen writing and the lexical richness of C-gen writing.

Word length and frequency varied significantly between the three writing environments: T-gen writing incorporated the most sophisticated vocabulary whereas mean word lengths were shortest and word frequencies highest in C-gen writing. There were significant inter-class differences in lexical richness of writing in each writing environment, but children in classes 3 and 4 tended to use the most sophisticated vocabulary no matter the writing environment and those in classes 2 and 5 the least.

Lexical richness of C-gen writing was significantly correlated with T+C-gen letter-counts: children whose T+C-gen letter-counts were higher tended to use both longer and lower-frequency words in their C-gen writing. In contrast, the correlations between lexical richness of C-gen writing and T-gen letter-count were non-significant. In addition, none of the correlations between C-gen lexical richness and spelling error percentages were significant in any of the three writing environments.

Effects of gender and age were also investigated. There were no gender differences in lexical richness. There was a weak age effect with older

children tending to use longer words but no significant difference for word frequency.

8.4.1 Letter-counts in T-gen or T+C-gen writing and the lexical richness of C-gen writing

Study 3 demonstrated significant differences between total letter counts with classes 1, 2, 6 and 8 being low-output and classes 4 and 7 high-output. In Study 4, overall lexical richness of writing was comparatively greater for classes 3, 4 and 7, and three of the classes exhibiting lower lexical richness were also low-output classes. Combined, these findings imply that children who wrote more might have tended to choose vocabulary of greater sophistication.

The ratio of T-gen letter-count (for example in copying) vs. T+C-gen letter-count (for example in explicit instruction) was higher for lower-productivity classes than the higher productivity. There are at least two possible reasons for this phenomenon. The first was a strong tendency for use of copied headings, which were often quite long whereas lesson content writing was often carried out using T+C-gen writing. The consequence is that in low-output classes there is necessarily a higher proportion of writing which is T-gen than T+C-gen. A second explanation is teaching-style. Although it was very frequent for children to write headings, some teachers might subsequently emphasise discussion of content more than extensive commitment of content to paper.

While the amount of T+C-gen writing occurring during the data collection weeks was significantly associated with lexical richness of C-gen writing, this was not the case for T-gen writing. One potential explanation is the depth of learning inherent in T+C-gen writing (particularly during explicit instruction), since the extensive semantic, phonological and orthographic input is likely to promote efficient processing, facilitating formation of long-term semantic memories (Perfetti, 2007; Perfetti & Hart, 2002). Indeed, Graham and Harris (2017) demonstrated in their meta-analyses of writing

instruction that explicit instruction in vocabulary acquisition was an effective means of increasing compositional quality. However, very little is known about copying or the relative effectiveness of copying and explicit teaching (or other forms of T+C-gen writing) in promoting knowledge acquisition. The findings of Castles et al. (2007) and Laishley et al. (2015) suggested that copying words which are relatively long is cognitively demanding, and some words are segmented in non-semantic units which may compromise comprehension of novel vocabulary. Indeed, the process of copying does not depend on vocabulary comprehension. In contrast, a core principle of explicit teaching is the supervised use of novel vocabulary, carried out in order to promote internalisation of meaning. Together, these findings suggest that children might benefit from being in classes in which T+C-gen writing is prioritized at the expense of T-gen writing in terms of vocabulary acquisition.

Predictably the lexical richness of T-gen and T+C-gen writing were higher than in child- C-gen writing. T-gen and T+C-gen writing occur in settings in which novel or unfamiliar vocabulary is emphasised. In contrast, C-gen writing is an output medium which enables the display of knowledge and experimentation with text-generation rather than being a context for learning new vocabulary. As commented upon by Dobbs and Kearns (2016), words used in C-gen writing are selected by individual children from their own previously-internalised store of vocabulary. They are not likely to represent the entire gamut of vocabulary introduced by teachers.

Lexical richness variation between writing environments may also be influenced by the type of text (i.e. word-level, sentence-level or discourse-level) committed to paper by children in the separate writing environments. Vocabulary used in sentences, whether separately or in discourse, includes function words, for example articles and pronouns. The great majority of function words are short and high frequency. If units shorter than sentences are used (e.g. nouns in labels, or phrases in which nouns and verbs are combined with adjectives or adverbs) the proportion of function words is

likely to be lower. Study 2 showed that the majority of C-gen writing was at sentence-level or above; the probable consequence is lower mean word length and higher word frequency when compared with the other writing environments. At the other extreme, T-gen work included lists of topic-related attributes, for instance the characteristics of living creatures: movement, respiration, sensitivity, growth, reproduction, excretion, nutrition. These words are long and low frequency, and lists rarely included function words.

8.4.2 Spelling error rates in T-gen or T+C-gen writing and the lexical richness of C-gen writing

Study 4 showed that associations between spelling accuracy in either T-gen or T+C-gen writing and the lexical richness of C-gen writing were non-significant. This may be a product of lack of sensitivity of measurement, i.e. a simple categorisation of words into correctly or incorrectly spelled rather than a classification of error types. There are, however, other possible explanations.

Sumner et al. (2016) found that for children with dyslexia aged 8-11 years, the lexical richness of written language was correlated with spelling ability. This is in keeping with high cognitive load deriving from spelling processing resulting in limited available of working memory resources for word-generation, those with greatest cognitive load producing vocabulary of lower lexical richness. Sumner et al. also found that the correlation for age-matched children without dyslexia was non-significant. Similarly, Study 4, which excluded children with FSM/EAL/SEN, found that this association was non-significant. For children whose spelling skills are well developed, working memory demands may not result in cognitive overload, as suggested by Sumner et al. The consequence would be independence of spelling and word-generation capabilities, i.e. a child may have fairly accurate spelling and write using vocabulary which is lexically rich or,

alternatively, children may have very well developed spelling skills but nonetheless generate vocabulary of limited lexical richness.

Key Stage 2 writing assessment has involved a series of separate assessment foci. One is spelling knowledge. Teachers may nonetheless sometimes emphasise other foci to a greater extent. Examples are given in Study 1. One teacher explained to a new pupil whose previous writing feedback appeared to have focussed almost entirely on transcription that she was only interested in his composing. Others stated that they believed that composing was more important than transcription. Overall, the relationship between spelling and lexical richness may vary according to the characteristics of teacher writing-expectations in a given task.

Thirdly, there may have been inter-class variation in the effectiveness of spelling tuition. This variation may have concealed any relationship between spelling error rate and lexical richness of writing.

A further possibility is that Study 3 identified that inter-class differences in spelling error-rate in T-gen writing and T+C-gen were non-significant. However, in C-gen writing, spelling error rate was significantly higher in class 3 than in classes 4 and 6. No other differences were significant. This may have been a product of genre differences, but classes 3 and 4 were the only two undertaking non-chronological report writing tasks and there were no significant differences in error rate for other genres. (Class 6 did not undertake a genre-based writing task during the data collection week.)

8.4.3 Gender and age

The achievement of boys in Key Stage 2 writing SATs lags behind girls (Beard & Burrell, 2010) and continues to cause widespread concern. Nonetheless, no links were identified between lexical richness and gender in the current study. Williams et al. (2013) noted that although boys' verbal abilities were not significantly different from girls', the boys used less

sophisticated vocabulary in their writing (SATS). While the lack of gender effects for lexical richness in Study 4 appeared not to be consistent with the findings of Williams and Larkin, Jones and Myhill (2007) found that the range of writing abilities for boys was wider than girls (as identified in this project). Strand (2014) commented that level of achievement for low SES boys from certain ethnicities including white British, was noticeably limited, but this study excluded children qualifying for FSM. The differential between boys' and girls' writing performance has also been attributed to motivation (Mata, 2011; Pajares & Valiante, 2001), but this may not have been evident at the participating schools. In addition, because the participating schools were comparatively small, many children were in mixed age group classes but there has been little research comparing boys' and girls' behaviour in single year or mixed age group classes.

There is a widely acknowledged age effect on achievement within each school Year (e.g. Crawford et al. (2007), typically measured against statutory assessments such as Key Stage 2 SATs. The current study investigated lexical richness rather than compositional quality in order to examine whether there was a specific vocabulary-related contribution to the age effect identified by Crawford et al.. There was a weak positive association between age and word length although not for word frequency. The finding for word length was consistent with expectations since later acquired words tend to be longer Gierut and Morrisette (2012). The lack of association for word frequency may be a product of the preponderance of high frequency function words, suggesting a requirement for greater sensitivity of measurement (for example exclusion of function words). An alternative explanation is that younger children within a school year are more likely to be identified as having SEN (Parsons & Platt, 2017) and children with SEN were excluded from this study. This may have reduced the opportunity for detection of an age effect.

Gender and age effects are probed in Study 7.

8.5 Key points and conclusions

Study 3 showed that there was significant inter-class variation in the amount written in the three writing environments. Study 4 developed this finding by identifying that while the lexical richness of C-gen writing was positively associated with amount of T+C-gen writing it was not linked with T-gen letter-count (or spelling in either writing environment). This suggests that it might be advantageous for children to belong to classes in which there is an emphasis on T+C-gen writing. The difference between the outcomes of T-gen writing and T+C-gen writing is explored further in the remaining three studies in this project.

9 Study 5 SPELLING STRATEGIES IN COPIED AND CHILD-GENERATED WRITING

9.1 Introduction

The previous chapter, Study 4, examined links between transcription and word-level text generation using transcription data from Study 3 and measures of the lexical richness of vocabulary. The results showed that the association between amount of T-gen writing and the lexical richness of C-gen writing was non-significant. In contrast, the amount of T+C-gen writing that children had completed was significantly associated with greater lexical richness of vocabulary in their C-gen writing. Study 5 probed the first of these findings; the second is explored further in the following chapter (Study 6).

The extent to which the words introduced in tuition become stored in long-term memory determines their availability for C-gen writing. According to Perfetti (2007), the effectiveness of vocabulary learning is dependent on depth of processing. Formation of stable word representations in long-term memory requires not only accurate phonological and orthographic knowledge but also comprehension of meaning. If children lack accurate orthographic representations or awareness of phoneme sequences in words, semantic knowledge might be compromised which may constrain C-gen lexical richness. This may explain the lack of association between amount of T-gen writing and C-gen lexical richness observed in Study 4.

Copying in the classroom

The purpose of copying (the majority of T-gen writing, see Studies 2 and 3) is accurate replication of source material. It is likely to be cognitively demanding for children at primary school since it incorporates both

handwriting and spelling, neither of which may be automatized (Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013; Pontart et al., 2013). There may also be teacher-imposed time pressure, for instance although the class 8 teacher considered that only 10% or less of her pupils found it difficult to handwrite quickly enough, many of her pupils were unable to record substantial proportions of the information presented in a science lesson during the time allotted (see Study 2). A requirement to handwriting and spell as quickly as possible would seem likely to increase demand on working memory resources and consequently reduce resources available for deep processing of unfamiliar vocabulary.

Copying also requires gaze shifting. Laishley et al. (2015) investigated frequency of gaze-lifts made by children aged 9-10 years copying single words which were four or eight letters in length from a distant source. The probability of a gaze shift was 19% for short high frequency words and 33% for short low frequency words. The likelihood of a gaze shift in longer words was 71%, but there was no significant difference between high and low frequency words. The difference in the frequency effect for short or long words was attributed to a greater tendency for longer words to be processed non-lexically. In contrast, short words appeared to be processed in their entirety, via a lexical pathway. Laishley et al. also found that 50% of the gaze shifts did not coincide with syllable boundaries. Both of these findings suggest that there may be limitations on the effectiveness of semantic processing of vocabulary during copying.

When children refer back to source material during copying tasks they may not return to the correct location. Castles et al. (2007) examined letter-position coding and found that children aged 8-10 were still developing position information accuracy. Accurate letter-position encoding is necessary for coding of subsequent letters. A possible consequence is errors involving letter omissions or additions.

These combined cognitive demands may precipitate children to make phonologically implausible errors when copying, associated with lack of comprehension.

C-gen writing

The purpose of C-gen writing is to demonstrate knowledge and creativity through text generation. Like copying, it involves transcription which is likely not yet to be automatized. Nonetheless, pupils in several classes appeared to experience less time pressure when completing C-gen writing tasks than during copying tasks. One teacher mentioned that children were given ‘as much time as they need’ for free composition, and several others made similar comments.

C-gen writing presents challenges not encountered in T-gen or T+C-gen writing, for example idea generation and structuring narratives. However, data from preparation sessions for genre-writing tasks indicated that there was extensive tuition in ideation and generation of sentences in grammatical styles and registers appropriate for specific genres. In addition, in many cases preparation included acquisition of content knowledge and planning. Together these are likely to reduce concurrent working memory demands (Kellogg, 2008).

Unlike copying, children are likely to understand the words they are using in C-gen writing (Dobbs & Kearns, 2016). Nonetheless, orthographic representations for some words may not always be fully specified. Torrance and Galbraith (2006) and others have suggested that in self-generated writing a phonological ‘inner voice’ stores narrative content immediately before it is committed to paper. This is likely to include phoneme sequences (M. Torrance, personal communication, June 27, 2019). If uncertain spellings in child-generated writing are transcribed from an ‘inner voice’ it would consequently seem probable that there is a tendency to use correct phonemes in the appropriate sequence. This would enable a spelling attempt which, while potentially incorrect, tended to be phonologically plausible.

Analysis of spelling errors

The previous paragraphs indicate that analysis of spelling errors would potentially increase understanding of spelling in the classroom. A variety of procedures for investigation of spelling errors have been designed (see Treiman & Bourassa, 2000). These include:

- correct vs. incorrect (as in UK spelling SATs and in many standardized assessments)
- correct vs. phonologically plausible (using the most frequent phoneme/grapheme correspondence) vs. phonologically implausible
- correct vs. phonologically plausible (using any valid phoneme/grapheme correspondence and acceptable graphotactic letter sequences) vs. phonologically implausible
- complex systems incorporating orthographic rules, multiple phoneme/grapheme correspondences and morphemic errors.
- use of spelling strategies (as in *Assessing Pupils' Progress*, see chapter 3).

As well as choosing a procedure appropriate for the research question, selection of an suitable means of analysis should take into account the spelling knowledge of the participants. The UK NC curriculum for spelling specifies that children should receive tuition based on synthetic phonics (see chapter 3, *Curricula and Assessments*, and Study 2). A feature of synthetic phonics tuition is that children will have been introduced to multiple acceptable grapheme/phoneme correspondences by the time that they complete primary school. This suggests that a method involving only the most frequent phoneme/grapheme correspondence would be inappropriate.

Aims

The main aim of Study 5 was to investigate differences in the phonological plausibility of spellings in order to clarify spelling strategies when children are either copying or producing C-gen writing.

Objectives

- (1) to separate spelling errors from copied and child-generated writing into two categories: phonologically plausible and other-errors, and calculate mean word lengths, word frequencies and spelling error percentages for each.
- (2) to investigate whether the ratio of phonologically plausible vs. other errors differs between copied and C-gen writing.
- (3) To consider the findings in terms of the results of Study 4.

9.2 Method

See Chapter 5, method studies 2-7.

9.2.1 Participants

Writing samples from 94 children, including 46 boys (mean age =10.20 years, SD = .25, range 9.67-10.75) and 48 girls (mean age =10.14 years, SD = .33, range 9.50-10.75) were analysed. Children with FSM/EAL/SEN were excluded, since the characteristics of written vocabulary used by participants in this group might differ from those without. The participants included children with missing data providing there was data from both copied writing and C-gen writing.

9.2.2 Data

Two subsets of the transcription data were assembled per child:

Copied writing was a sub-set of T-gen writing and constituted all headings and lesson content copied from a whiteboard during the data collection week. It did not include spelling tests, or spelling and handwriting practice which typically involved individual photo-copied sheets.

C-gen writing included all text generated by children during the data collection week, whether multi-paragraph genre-writing or at sentence- or word-levels.

Inspection of the written data gathered for this PhD project provided evidence that at least some copying from class whiteboards occurred under time pressure, which may impact on the depth of processing of unfamiliar vocabulary. In contrast, there was much less evidence of time pressure in child-generated writing (see Study 2 for analysis).

9.2.2.1 Spelling errors

The aim of Study 5 was to examine transcription of ‘inner speech’ in child-generated writing specifically at phoneme level. Spellings were categorised as either phonologically plausible (correct phonemes in correct sequence with any valid grapheme/phoneme relationships, and with graphotactic rules for English observed) or those which did not fulfil these criteria (‘other-errors’).

The participating children’s spelling errors were allotted to phonologically-plausible or ‘other errors’ using *The Complete Phonic Handbook* (Hope, 2001) and *A Survey of English Spelling* (Carney, 1994). The phonologically plausible errors were considered to represent the ‘inner voice’ with serial processing of individual phonemes for words with uncertain spellings, whereas the latter did not.

Examples of phonologically plausible errors included:

- Spellings of words which were incorrectly run together or divided (e.g. ‘alot’, ‘all though’)
- Incorrectly spelled schwa sounds in unstressed syllables (e.g. begin/bigin)
- Omitted silent letters (e.g. known/nown, government/goverment’)
- Homophones (e.g. there/their/they’re)

9.2.3 Analysis

Mean word lengths and frequencies were calculated for all words in the copied and C-gen texts. Spearman correlations were carried out to investigate associations between spelling error percentages and word lengths or frequencies.

Spelling errors were divided into two categories: phonologically plausible and other errors. Mean lengths and frequencies were calculated for each category. Wilcoxon tests were calculated to compare lengths and frequencies of words with spelling errors in copied and child-generated writing, and also for phonologically plausible and other-errors.

The relationship between copied vs. child-generated writing and spelling error category was investigated using a Pearson Chi-Square test.

9.3 Results

9.3.1 Word lengths and frequencies

9.3.1.1 Mean lengths and frequencies for all copied and C-gen words and spelling error percentages

Mean word lengths, word frequencies and spelling error percentages were calculated for all words, and also after separation into copied and child-generated writing categories (see table 48).

Table 48 Mean word lengths, word frequencies and spelling error percentages in copied and C-gen writing

	Word-count		Word length		Word frequency		Spelling error percentage	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
All copied and C-gen words	308.67	182.91	5.00	.42	11.52	.52	6.65	5.99
Copied	45.30	38.12	5.31	.69	11.41	.73	6.41	6.83
C-gen	263.37	183.77	4.69	.44	11.64	.57	6.88	7.59

Wilcoxon tests were calculated to compare word lengths and frequencies in copied and C-gen writing. These showed that copied word lengths were significantly greater than C-gen word lengths ($Z = -6.90, p < .001$).

Spearman correlations were carried out to investigate associations between spelling error percentages and mean word length or frequency in either copied or C-gen writing. For copied writing, correlations were non-significant (word length: $p = .813$, word frequency: $p = .616$). For C-gen writing, correlations were also non-significant (word length: $p = .483$, word frequency: $p = .912$).

Overall, spelling error percentage did not appear to be associated with mean word length or frequency, whether the writing was copied or C-gen.

9.3.1.2 Mean lengths and frequencies of words with spelling errors

Mean word lengths and log word frequencies were calculated for all words with spelling errors, and also after separation into copied and child-generated writing categories (see table 49).

Table 49 Lengths and frequencies of words with phonologically plausible spelling errors or other-errors

	All errors		Copied errors		C-gen errors	
	Mean	SD	Mean	SD	Mean	SD
Word length						
Phonologically plausible errors	6.76	2.18	7.67	2.72	6.65	2.08
Other-errors	7.01	2.36	7.88	2.40	6.81	2.30
Log word frequency						
Phonologically plausible errors	9.59	2.54	9.01	2.96	9.67	2.48
Other-errors	9.55	2.47	9.32	2.25	9.60	2.52

Word lengths and frequencies were compared using Wilcoxon tests.

All words: The mean length of words with phonologically plausible spelling errors was significantly shorter than for words with 'other-errors' ($Z = 6.68$, $p < .001$). The difference in mean word frequency was non-significant.

Copied writing: The difference between mean length of words with phonologically plausible errors and those with other-errors was non-significant ($p = .211$). Similarly, the difference between the mean frequencies of words with phonologically plausible errors and those with other-errors was non-significant ($p = .131$).

C-gen writing: The difference between mean length of words with phonologically plausible errors and those with other-errors was non-significant ($p = .294$). Similarly, the difference between the mean frequencies of words with phonologically plausible errors and those with other-errors was non-significant ($p = .413$).

Phonologically plausible errors: The mean length of words with phonologically plausible errors was greater in copied than C-gen writing ($Z = -3.41$, $p = .001$). The difference in frequency was non-significant ($p = .614$).

Other-errors: The mean length of words with other-errors was greater in copied than C-gen writing ($Z = -4.701$, $p < .001$). The difference in frequency was non-significant ($p = .577$).

9.3.2 Spelling errors in copied or child-generated writing

A Pearson Chi-Square test was carried out to investigate links between writing environment (i.e. copied vs. C-gen writing) and spelling error category (phonologically plausible vs. other). There was a significant relationship ($X^2(2) = 21.97$, $p < .001$). Phonologically plausible errors were

less frequent than other errors in copied writing whereas they were more frequent in C-gen writing. The error percentages are compared in table 50.

Table 50 Error category percentages in copied and child-generated writing

	Phonologically plausible N = 1044	Other-errors N = 783
Copied writing N = 264	44%	56%
C-gen writing N = 1563	59%	41%

Words common to both copied and child-generated writing

A further analysis was carried out in which spelling error rates in words which were used in copying *and* C-gen writing were compared (see table 51). Amongst the word-types common to both, there were spelling errors in 33.

Table 51 Error category percentages in words common to both copied and child-generated writing

	Phonologically plausible	Other-errors
Copied writing	30%	70%
C-gen writing	42%	58%

For the set of words used in common, there was a greater proportion of other-errors in both copied and C-gen writing. However, phonologically plausible spelling errors were nonetheless more common amongst C-gen writing spelling errors, and other-errors were more common amongst copied spelling errors. A Pearson Chi-Square test was not justifiable since word sample size was small.

9.4 Discussion

Key findings

Study 5 examined the relationship between writing environment (copying vs. C-gen writing) and types of spelling mistake made (phonologically plausible errors vs. other-errors). The main finding was that phonologically plausible errors were more frequent in child-generated writing than in copied writing, whereas other-errors were more frequent in copied writing than in child-generated writing.

9.4.1 Spelling errors in copying

Children aged 9-10 years made significantly more phonologically implausible spelling errors when copying than phonologically plausible spelling errors. Similarly, Bonin et al. (2015) found that the great majority of spelling errors made by adults when copying were phonologically implausible (> 99%).

This finding may be linked with the lack of association between amount of T-gen writing and the lexical richness of C-gen writing identified in Study 4. Castles et al. (2007) showed that letter position coding (potentially impacting on accuracy of gaze-relocation on source material) is not likely to be mature by 9-10 years. In addition, Laishley et al. (2015) found that children were not always able to replicate longer letter sequences accurately during copying, attributed to working memory limitations. Lack of automaticity of transcription skills and teacher-imposed time-limits may also have impacted on spelling strategies. A possible outcome of this level of demand on working memory is that when children copy they may be unable to process vocabulary knowledge sufficiently deeply to enable words to be stored in long-term memory. Those words are consequently unavailable for use in future C-gen writing.

A substantial minority of spelling errors in copied writing were phonologically plausible. Although this suggests that children were

sometimes processing words phonologically, some may have been habitually misspelled, including homophones and schwa errors. In addition, given the finite number of possible spellings for each word, phonologically plausible spelling errors may have occurred by chance.

9.4.2 Spelling errors in C-gen writing

The processing involved in C-gen writing may differ substantially from that used in copying and, unlike copying, 59% of spelling errors in C-gen writing were phonologically plausible. Vocabulary used in child-generated writing has been internalized following deep processing, which incorporates acquisition of sufficient phonological, orthographic and semantic knowledge to enable formation of strong word representations (Dobbs & Kearns, 2016; Perfetti, 2007). The pronunciations of words stored in long-term memory are consequently likely to be familiar. Adams et al. (2013), Chenoweth & Hayes (2003) and Torrance and Galbraith (2006) proposed an online ‘inner voice’ operating during self-generated writing, which provides access to sequences of phonemes, potentially facilitating the writing of words with uncertain spellings. This account is consistent with the current finding that the majority of C-gen spelling errors were phonologically plausible.

Approximately two-fifths of the spelling errors in C-gen writing were phonologically implausible. There are a number of possible reasons. For example, some phonological representations may have still been sufficiently unstable to enable accurate transcription. Alternatively, there may be graphotactic errors. A further factor is the combination of the depth of English orthography and UK spelling instruction. By Year 5 (9-10 years), children are expected to have acquired considerable knowledge of phoneme/grapheme correspondences through tuition in synthetic phonics. Nonetheless, spelling skill automatization is unlikely to be complete and it is probable that errors involving phoneme/grapheme correspondences will continue.

9.5 Key points and conclusions

The current study indicated that phonologically plausible errors were more frequent in child-generated writing than in copied writing. Conversely, other-errors were more frequent in copied writing than in child-generated writing. A possible conclusion from these findings is that copying may be an inefficient means of learning vocabulary as demonstrated by the types of spelling errors made. Vocabulary acquisition in T+C-gen writing may be more effective; this is examined in the following chapter (Study 6).

10 Study 6 TRANSFERRING VOCABULARY FROM CLASSROOM LEARNING TO GENRE-WRITING

10.1 Introduction

Study 4 (links between transcription and word-level text generation) demonstrated a significant correlation between amount of T+C-gen writing and the lexical richness of C-gen writing. Study 6 followed up the Study 4 finding by investigating the extent to which words used in preparation sessions for genre-writing tasks were subsequently used in genre-writing tasks themselves, and whether this amount was associated with compositional quality of the genre-writing.

While vocabulary is acquired in many settings, an important aspect of classroom tuition is introduction of complex topic-specific vocabulary. Children encounter unfamiliar words in both T-gen and T+C-gen writing environments. In T-gen writing the words are copied. However, in T+C-gen writing the words are introduced through procedures such as explicit instruction, in which vocabulary chosen by a teacher is discussed and modelled, and then used by children independently in teacher-supervised sentence-writing.

In order for a given word to be used in C-gen writing it must be represented in long-term memory. Indeed, according to Dobbs and Kearns (2016), one of the strongest indicators that a writer understands an academic word is its selection for use in writing. In their investigation of writing by children aged 9-12 years, Dobbs and Kearns conducted an investigation of word and learner characteristics predicting the use of academic vocabulary introduced in a one-week intervention in a subsequent 20 minute persuasive writing task. They found that the mean probability of use of a newly introduced

word was .37. Of the potential word and learner predictors, three increased likelihood of use: word frequency, higher ability and not using EAL.

Creation of long-term word representations depends on knowledge of the semantic, phonological and orthographic characteristics of a word (Perfetti, 2007). A possible reason for the lack of significant association between amount of T-gen writing occurring and the lexical richness of C-gen writing is that there was insufficient opportunity for gaining knowledge of word characteristics in the T-gen writing environment to enable formation of long-term representations. The findings of Study 5, discussed in the previous chapter, were consistent with this explanation.

Study 4 showed that (unlike T-gen writing) the association between amount of T+C-gen writing and the lexical richness of C-gen writing was significant. The data collected for this project indicated that preparation for genre-writing tasks invariably involved T+C-gen writing, for instance during explicit instruction (Archer & Hughes, 2011) which has been demonstrated to be an efficient technique for promoting vocabulary acquisition (Graham & Harris, 2017). If the explanation given in the preceding paragraph is valid, children were acquiring word-knowledge during sessions in which there was T+C-gen writing. This would appear likely to have been a product of teachers explaining and pronouncing unfamiliar vocabulary, and the supervised writing during which the children wrote the words.

Dockrell et al. (2016) reported that primary school teachers placed high priority on word-level work and the NC specifies that pupils should 'select appropriate and effective vocabulary'. Vocabulary usage is incorporated in Assessing Pupils' Progress (APP) and SATs, and described in Chapter 3. While the vocabulary criteria for both are brief, the SATs criteria illustrate the progression towards precision and variety, both of which enable precise representation of meaning. It implies that it is necessary for children to acquire knowledge of a considerable number of individual words (word-

types). This was shown in Table 5 (from chapter 3) which is repeated below for ease of reference.

Table 5 SATs writing English assessment expectations for vocabulary, levels 2-5¹

Level 5	<ul style="list-style-type: none"> <input type="checkbox"/> Vocabulary predominantly appropriate to text type and genre. Precise word choice may create impact and augment meaning. <input type="checkbox"/> Varied stylistic features may support both purpose and effect, e.g. alliteration, metaphors, puns, emotive phrases.
Level 4	<ul style="list-style-type: none"> <input type="checkbox"/> Ideas and events developed through some deliberate selection of phrases and vocabulary, e.g. technical terminology; vivid language; word choice for effect or emphasis. <input type="checkbox"/> Some use of stylistic features support purpose, e.g. formal / informal vocabulary; appropriate use of similes.
Level 3	<ul style="list-style-type: none"> <input type="checkbox"/> Some detail / description of events or ideas expanded through vocabulary (simple adverbs, adjectives) or explanation. Some vocabulary selected for effect or appropriateness to task.
Level 2	<ul style="list-style-type: none"> <input type="checkbox"/> Some detail included through adventurous word choice appropriate to task (a big, hairy caterpillar...Mr. Jones looked cross...bears are fierce...).

¹ Expected attainment for Year 5 (9-10 years): level 2 (below expectation for Year 5), levels 3 and 4 (expected), and level 5 (above expectation).

The NC for Key Stage 2 English at UK primary schools requires that children are taught a series of writing genre-characteristics and secondly complete writing tasks in these genres (DfES, 2006). Table 52 summarises characteristics for those used in the data collection period.

Table 52 Key Stage 2 writing genres

Genre	Examples of genre-characteristics
Newspaper report	Eye-catching title, past tense, third person, events in chronological order, quotations, facts
Non-chronological report	Simple informative title, third person, formal register, technical vocabulary, facts
Persuasive writing	Personal opinion in opening sentence, evidence to back up opinion, present tense, time connectives, rhetorical questions
Narrative retelling	Eye-catching opening, descriptions of setting and characters throughout narrative, build up, cliff-hanger, resolution

Little is known about the relationship between compositional quality and the amount of written experience of novel or unfamiliar vocabulary which children are given in real-life classroom settings. The current study examined whether the number of different word-types written during preparation for a given genre-based writing task was associated with the compositional quality of the C-gen genre-writing. It also investigated whether there was evidence of inter-class differences, as identified in Studies 2-4, and genre-differences since vocabulary usage has been found to differ between genres (Olinghouse & Wilson, 2013). Finally the effects of type of preparation provided for children before a genre-writing task were considered (varying forms of T+C-writing including writing during explicit instruction and note-taking). It was recognised that in an exploratory study of this size, class/genre/preparation effects were unlikely to be fully distinguishable. However, the results might help to inform the design of Study 7.

Aims

The main aim of Study 6 was to examine links between written vocabulary in T+C-gen genre-writing preparation sessions and its subsequent use in the genre-writing task itself. An additional aim was to investigate whether there were effects of class, genre, or genre preparation on genre-writing scores.

Objectives

- 1) to allocate words written by children to lists of vocabulary used in genre-writing preparation and genre-writing tasks.
- (2) to score compositional quality of genre writing using Assessing Pupils' Progress criteria.
- (3) to investigate links between numbers of words in each vocabulary list and genre-writing scores.
- (4) to compare genre-writing scores between classes, genres, and types of genre-writing preparation activities.
- (5) to compare findings with the results of Studies 3 and 4.

10.2 Method

See Chapter 5, method studies 2-7.

10.2.1 Participants

Writing samples from 59 children, including 27 boys (mean age =10.20 years, SD = .28, range 9.67-10.67) and 32 girls (mean age =10.16 years, SD = .33, range 9.50-10.76) were analysed. Any pupils with missing genre-based writing or genre-based writing preparation data were excluded (including the entirety of classes 1 and 6). Children FSM/EAL/SEN were also excluded.

10.2.2 Data

10.2.2.1 Vocabulary

Written transcripts indicated that teachers had incorporated topic-relevant word-types for each genre-writing task during preparation for genre-writing tasks. Records were made of all written word-types used in T+C genre-writing preparation and in the C-gen genre-writing output itself. An example of the written prompts provided by the teacher of class 4 and a child's responses is shown in table 53.

Table 53 Written content of T+C-gen preparation for subsequent C-gen genre-writing task

Teacher prompt	Written responses by child
Vocabulary	Hades, Cydra, Tartus, Spits Poison, Spirits, Blood, Lava, Cyclops eye, Bear Claws, Eagle Talons, Scorpion sting, Dragon Wings, Bronze fur, Scary, Cautious, destructive, Fatal, Male, Ferocious, Muscular, Lethal. Melted, Small, (Flat faced), slimy, scaly, Stick thin (words chosen by child stemming from classroom discussion)
Connectives	Then, And, Apart from, Although, As well as, However.
The beast's powers/special features/behaviour	Chop off one head two grow back. Spat poison. breathes fire. Feeds on Satyrs, Centaurs and demigods.
Myth that makes it famous.	Threw all heroes into the fiery remains of Tartus. Fought Hercules and got killed.
Time contrast, Adding, Cause and effect.	The Cydragosus is famous for throwing all heroes into the fiery remains of Tartus.

Table 54 shows examples of topic-relevant word-types used in T+C-gen and/or C-gen writing.

Table 54 Example topic-relevant words for each class

Class 2 Newspaper report on football match	Class 3 Report on biology of mythological plant	Class 4 Report on Greek mythological beast	Class 5 Persuasive argument for or against zoos	Class 7 Retelling of A Midsummer Night's Dream	Class 8 Newspaper report on Greek hero
proud	pollinating	scaly	species	Puck	invade
penalty	dispersal	demigods	conservation	duke	attacked
defend	flavouring	ravaged	worldwide	servant	philosopher
interviewed	species	ferocious	impact	forest	citizens
reported	nutrition	talons	managed	enchanted	Romans
fantastic	petal	legend	dangerous	refuses	Rome
goal	germination	cautious	threatened	potion	soldier
trained	shoot	destined	welfare	fairies	Greek

All of these topic-related words written by children had log word frequencies <10.5 (from ELP, Balota et al., 2007).

Four lists of word-types were created for each child:

List 1. All word-types used in written preparation for genre-based writing.

List 2. Topic-relevant word-types used in written preparation for genre-based writing

List 3. Word-types which occurred in both List 1 (all word-types in written preparation) and the genre-writing.

List 4. Topic-relevant word-types which occurred in both List 2 (topic-relevant word-types in written preparation) and the genre-writing.

10.2.2.2 **Genre-writing assessment**

Genre-writing task assessment was carried out using Assessing Pupils' Progress (APP) procedures, as described in Chapter 3. This method was selected rather than SATs because interview data used in Study 1 indicated that APP was widely used by the teachers. In addition there was flexibility in end of KS2 testing arrangements over the transition to purely teacher-assessment and there was no information available about participating school choice on assessment methodology. Use of standardized assessment would have been inappropriate since children's writing conditions did not comply with test procedures as described in assessment manuals.

The marks were converted into ordinal ratings on a scale of 1-12.

Subsequently, the ordinal ratings were banded into three categories: below expectation, expected range of levels for children in Year 5, and above expectation, as shown in table 55.

Table 55 Genre-writing scoring

Teacher assessment level	National curriculum achievement range	Ordinal ratings used in current study
Low level 2	Below expectation	1
Secure Level 2		2
High level 2		3
Low level 3	Expected range of levels for children in Year 5	4
Secure Level 3		5
High level 3		6
Low level 4	Above expectation	7
Secure Level 4		8
High level 4		9
Low level 5		10
Secure Level 5		11
High level 5		12

Reliability of genre-writing scoring

Class teacher 5 had levelled the children's work prior to photography (data from 22 children). To test inter-rater agreement, these items were re-levelled during the current study, without reference to teacher marking, and the results were compared:

	Mean	Standard deviation
Teacher assessment	7.36	1.49
Study 6 score	7.27	1.51

The Kappa test result indicated substantial agreement (Kappa value = 0.81, $p < .001$).

10.2.3 Analysis

The distribution of data were examined. Non-parametric tests were used since some variables did not follow a normal distribution. Bonferroni corrections were used when appropriate. A significance level of $p < .05$ was adopted.

Child-level: Mean numbers of written word-types were calculated for each of the four vocabulary lists. Mean genre-writing scores were also calculated. Spearman correlations were calculated between numbers of word-types in each list and genre-writing score, using Bonferroni corrections.

Class-level: Mean numbers of written word-types were calculated for every class for each of the four vocabulary lists. Mean genre-writing scores were calculated for each class and Kruskal-Wallis tests with post-hoc Mann-Whitney tests with Bonferroni corrections carried out to investigate inter-class differences between writing scores.

Genre-level: Mean genre-writing scores were calculated for each writing genre. Kruskal –Wallis tests with post-hoc Mann-Whitney tests with Bonferroni corrections were carried out to investigate inter-genre differences between writing scores.

Preparation for genre-level writing task: Mean genre-writing scores were calculated for each preparation procedure. Kruskal–Wallis tests with post-hoc Mann-Whitney tests with Bonferroni corrections were carried out to investigate inter-preparation procedure differences between writing scores.

10.3 Results

10.3.1 Child-level

Numbers of words in Lists 1-4

Table 56 compares the mean numbers of word types in each of the four lists for all children. It shows that nearly half of the word types used in preparation for genre-writing tasks were utilised in the task itself.

Approximately a third of the topic-relevant word types used in preparation for genre-writing tasks were subsequently used. However, the ranges of numbers of words in each category were considerable.

Table 56 Numbers of word types used in each of the four lists

List	Number of:	Mean	Range
1	word-types in written preparation	70.10	17-175
2	topic-relevant word-types in written preparation	29.74	2-96
3	word-types used in both the written preparation and the genre-writing	31.51	4-101
4	topic-relevant word-types used in both the written preparation and the genre-writing	9.83	0-43

Genre-writing score

The mean genre writing score across all children was 7.10 (range 2-11).

Genre writing scores vs. numbers of word-types

Spearman correlations were calculated between genre-writing score and numbers of word-types in each list (Bonferroni correction: $p < .008$). All were significant and positive: List 1 (all word-types) $\rho = .50$, $p < .001$, List 2 (topic-relevant word-types) $\rho = .52$, $p < .001$, List 3 (word-types used in both preparation and genre-writing) $\rho = .39$, $p < .003$, List 4 (topic-relevant word-types used in both the preparation and genre-writing) $\rho = .34$, $p < .008$.

Figure 13 shows the distribution of number of word-types for each of the 4 word-type lists, plotted against genre-writing score.

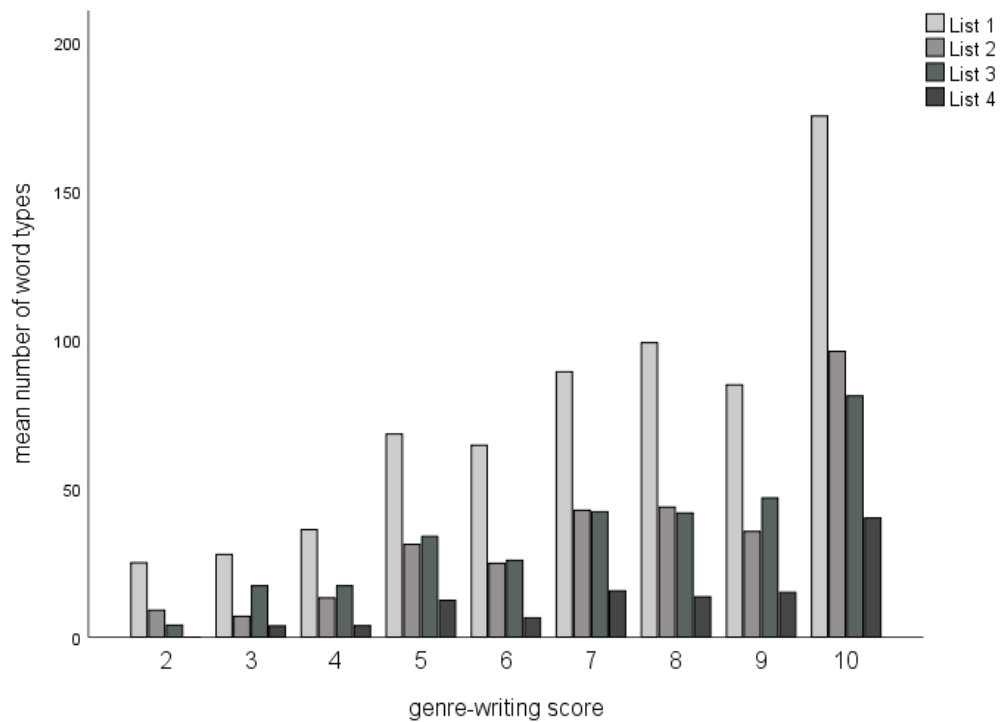


Figure 13 Relationships between genre-writing score and number of word-types used in preparation for genre-writing tasks

The correlations showed that children gained higher teacher assessment levels in their genre-writing task if they had written a greater number of word-types in preparation sessions for genre-writing tasks, and also if the number of topic-relevant words-types was larger. Furthermore, if children had subsequently used more of the word-types and the topic-relevant word-types which they wrote in the preparation sessions in their actual genre-writing, the scores were higher.

10.3.2 Class-level

Table 57 shows mean numbers of word-types and minimum and maximum values for every class in each of the Lists 1. Class 4 had the highest mean number in all four lists, classes 2 and 8 the lowest.

Table 57 Mean number of word types in lists 1-4 for each class

Class (N)	List 1				List 2				List 3				List 4			
	Number of written word-types used in preparation for genre-writing task				Number of written topic-relevant word-types (i.e. types in list 1 with word log frequency <10.5)				Number of list 1 word-types written in both the preparation sessions and the genre-writing task				Number of list 2 word-types written in both the preparation sessions and the genre-writing task			
	mean	SD	min	max	mean	SD	min	max	mean	SD	min	max	mean	SD	min	max
2 (8)	24.13	6.75	17	36	6.75	2.49	2	9	15.88	4.64	10	24	3.88	1.20	2	5
3 (9)	39.67	26.13	19	85	20.22	13.45	6	46	15.11	10.18	8	36	3.56	2.65	0	9
4 (13)	135.62	40.02	53	175	68.38	23.05	26	96	71.54	21.42	25	101	30.23	9.54	12	43
5 (19)	74.58	24.38	38	138	25.89	10.68	10	58	24.42	9.16	15	48	4.32	2.24	2	11
7 (4)	59.00	23.20	39	92	19.25	11.24	12	36	39.00	23.16	15	67	9.25	8.10	3	20
8 (6)	28.33	5.20	21	35	10.17	2.56	7	13	7.67	3.27	4	12	0.83	0.98	0	2

10.3.3 Interclass comparison of genre writing scores

Table 58 compares genre-writing performance between classes. The highest mean score was achieved by children in Class 4. The lowest were in classes 2 and 8.

Table 58 Mean genre writing scores and ranges for each class

Class	N	Mean score	min	max
2	8	4.50	4	5
3	9	7.67	5	10
4	13	8.00	6	11
5	19	7.53	5	9
7	4	7.75	7	10
8	6	6.00	2	8

A Kruskal-Wallis test was carried out to investigate differences in writing scores between the six participating classes. There was a statistically significant differences between the scores ($H(5) = 22.80, p < .001$). Post-hoc Mann-Whitney tests with the Bonferroni correction ($p = .003$) showed that writing scores in class 2 were significantly less than in all other classes with the exception of classes 7 and 8 (class 3: $Z = -3.34, p = .001$; class 4: $Z = -3.81, p < .001$; class 5: $Z = -3.95, p < .001$. Class 7: $p = .005$, Class 8: $p = .034$). No other scores were significantly different ($p \geq .039$).

10.3.4 Inter-genre comparison of genre writing scores

Genres varied between classes. Four of those expected in Key Stage 2 writing were used in the data collection weeks. Table 59 compares writing performance between genres.

Table 59 Mean writing scores and ranges for each genre

Genre	Classes	N	Mean score	min	max
Newspaper report	2 and 8	14	5.15	2	8
Non-chronological report	3 and 4	22	7.87	5	11
Persuasive writing	5	19	7.53	5	9
Narrative retelling	7	4	7.75	7	10

A Kruskal-Wallis test was carried out to investigate differences in writing scores between the genres. There was a statistically significant difference between the scores ($H(3) = 19.83, p < .001$). Post-hoc Mann-Whitney U tests (Bonferroni correction: $p = .008$) showed that writing scores in newspaper report writing (classes 2 and 8) were significantly lower than in non-chronological reports ($Z = -3.96, p < .001$) and persuasive writing ($Z = -3.74, p < .001$). No other scores were significantly different (newspaper vs. narrative retelling: $p = .017$; all other comparisons: $p \geq .570$).

10.3.5 Preparation for genre-writing tasks, comparison of genre writing scores

Types of preparation for genre-writing tasks varied between classes. Four were used in the data collection weeks. Table 60 compares writing performance between types of preparation.

Table 60 Mean writing scores and ranges for each type of preparation for genre-writing tasks

Preparation for genre-writing	Classes	N	Mean score	min	max
Note taking	2 and 5	27	6.67	4	9
Child-generated diagram	3 and 7	13	7.69	5	10
Table copying and completion	8	6	6.00	2	8
Explicit teaching	4	13	8.00	6	11

A Kruskal-Wallis test was carried out to investigate differences in writing scores according to method of preparation before genre-writing task. There was a statistically significant differences between the scores ($H(3) = 8.13, p = .043$), but post-hoc Mann-Whitney U tests with the Bonferroni correction ($p = .008$) showed that no pairwise differences were significant ($p \geq .018$).

Summary

The results of the Mann-Whitney tests suggest that genre writing scores in classes 2, 7 and 8 were lower than in the remaining classes. Writing scores

in newspaper reports (classes 2 and 8) were lower than in non-chronological reports (classes 3 and 4) or persuasive writing (class 5). Class, genre, and preparation for genre-writing tasks effects are not possible to separate in the current study owing to the limited number of tasks undertaken by each child over the data collection period.

10.4 Discussion

Key findings

Study 6 investigated the vocabulary used in preparation for specific genre-writing tasks and in the children's genre-writing itself, in order to investigate the extent of transference from preparation to C-gen writing. The main finding was that there were positive correlations between genre-writing scores and numbers of word-types used in the preparation for the genre-writing tasks (whether all word-types or topic-relevant word-types). In addition, the scores were higher if a greater number of words were used in both the preparation sessions and the genre-writing itself (again either all word-types or all topic-relevant word-types).

Additional findings included significant inter-class and inter-genre differences in genre-writing quality. In general, children in classes 3, 4 and 7, whose genre-writing tasks comprised non-chronological reports or narrative re-telling tasks tended to achieve higher mean scores. Those in classes 2, 5 and 8 tended to achieve lower mean scores, having written newspaper reports or persuasive text.

10.4.1 Vocabulary transfer

As indicated by Perfetti (2007), formation of stable word representations requires deep processing. All topic-relevant words investigated in the current study were of relatively low frequency and some may have been novel/unfamiliar to many class members. Children did use approximately one third of topic-relevant words despite their comparatively low frequency, reflecting the findings of Dobbs and Kearns (2016). It is not, however,

known whether vocabulary lists were made available during the genre-writing itself in the current study and, as in Dobbs and Kearns, there was no testing of relevant word knowledge prior to the investigation.

There may also be other explanations for the value of tuition sessions involving T+C-gen writing. Children may benefit from intellectual stimulation occurring in sessions involving T+C-generated writing, for instance explicit instruction, even if the beneficial effect of committing words to paper is comparatively limited. A stronger effect might instead derive from organised classroom discussion facilitating acquisition of higher-level skills. However, since writing is a necessary component of explicit teaching and similar activities, overall word-type count provides an approximate estimate of the amount of time spent in such environments.

10.4.2 Classes, genres and preparation for genre-writing

While there was considerable overlap between the inter-class and inter-genre analyses (or those associated with preparation for genre-writing tasks), each is interesting for theoretical reasons. Significant inter-class differences have been identified in this project, and the efficiency of vocabulary instruction might vary between classes, with potential consequences for classroom practice. While lexical richness variables have been shown to predict compositional quality, the effect sizes of given factors ranged widely between genres (as demonstrated by Olinghouse and colleagues). Vocabulary instruction tailored more specifically toward given genres may be more beneficial. All preparation for C-gen genre-writing tasks involved using T+C-gen writing. While some was based in explicit instruction, shown in the meta-analysis of writing instruction by Graham and Harris (2016) to be effective, there is a lack of evidence relating to, for example, vocabulary learning during note-taking.

Relationships between these factors may be complex and be affected by individual differences. It might, for example, be more difficult to internalize novel scientific nouns than novel adjectives for subsets of

individuals. In addition, there may be an interaction between tuition effectiveness and the frequencies of the novel/unfamiliar words – children may tend not to use more complex novel/unfamiliar words unless teaching has been highly effective in preparations sessions. An in depth investigation of the relative strengths of these factors would be achievable in future investigations using multilevel modelling, providing there was a sufficiently large sample size. It would also be beneficial to include classroom observation to gather data on instructional techniques in order to investigate teaching effectiveness.

The findings in the current study were consistent with class differences demonstrated in studies 3 and 4. In terms of letter-counts, lexical richness and genre-writing scores, classes 2, 5 and 8 were characterised by smaller letter-counts, vocabulary with less lexical richness and lower genre-writing scores. Conversely, in classes 3, 4 and 7 letter counts were higher, as was lexical richness, and genre-writing scores comparatively high.

10.5 Key points and conclusions

The main findings of the current study were firstly that approximately one third of low frequency topic-relevant words were used in both preparation sessions and C-gen genre-writing tasks, broadly comparable with Dobbs and Kearns (2016). Secondly, genre-writing scores were positively associated with numbers of word types (both overall and topic-relevant) used in preparation for the genre writing scores. An alternative explanation is that the amount of T+C-gen writing may simply measure the amount of experience of other beneficial aspects of teaching involving T+C-writing, for example classroom discussion of text structure and planning.

Study 7 is the culminating enquiry in this series of investigations. In it analyses are carried out to identify predictors of genre-writing scores, using variables which have been considered in Studies 1-6.

11 Study 7: PREDICTORS OF THE COMPOSITIONAL QUALITY OF GENRE-WRITING

11.1 Introduction

Writing remains a vital skill in education and continues to play an essential role in many career pathways. It is a taught skill and the effectiveness of tuition intended to establish writing skills is clearly important. There have been a considerable number of studies investigating predictors of compositional quality. Variables such as children's demographic characteristics have been shown to be significant, for example age, gender and using EAL (Crawford et al., 2007; DfE, 2017; Medwell et al., 2009). However, little is known about the impact of teacher-level factors. For example, while there is evidence from surveys that teachers feel ill-prepared for writing tuition, the relative importance of this perception for children's writing has not yet been investigated. Furthermore, the influences of T-gen or T+C-gen writing experience on the compositional quality of C-gen writing have not previously been investigated.

The purpose of Study 7 was to investigate predictors of compositional quality in C-gen genre-writing. While the principal outcome variable was compositional quality, parallel analyses were carried out for mean genre-writing word length and frequency, in order to compare predictors at discourse- and vocabulary-levels.

Study 7 drew on the findings of Studies 1-6. These studies were principally correlational and, as a result, the variables were not considered in combination. Studies 1-6 have, however, provided a means of selecting variables for inclusion in the final analyses, carried out in Study 7. Teacher characteristics selected for this study were years since qualification and

teachers' perceptions of the adequacy of their training in handwriting tuition. As described in Study 1, interview data suggested that the group of teachers who had been qualified for longer expressed a different set of beliefs relating to classroom tuition than those qualified more recently. For example, the findings suggested that participants further into their teaching careers had become less likely to follow school or national handwriting policies, either because they were less aware of their content or felt that it was not necessary to abide by them, and also because they felt that the policies were inconsistent with their personal teaching beliefs and principles. Despite assumptions that teacher effectiveness increases with experience, Slater, Davies, and Burgess (2012) found that effectiveness was lower only in the first year after qualification and Jones et al. (2013) found that mid-career teachers were more likely to use interventions effectively than those at the beginning and end of their careers. Ball (2003) and Wilkins (2011) highlighted contrasts between teachers qualified after introduction of performativity into assessment of teacher-effectiveness and those who have qualified less recently.

In terms of training adequacy, a substantial proportion of teachers who have participated in previous teacher surveys have identified that they do not feel fully prepared for teaching handwriting or promoting handwriting speed (Barnett et al., 2006; Cutler & Graham, 2008; Graham, Harris, et al., 2008). Teacher responses in the Study 1 interviews and questionnaires also indicated a relative lack of preparedness for handwriting tuition, particularly related to promotion of handwriting speed. There was clear evidence in Study 1 of cognitive dissonance relating to the strengths of links between compositional quality and either handwriting speed or neatness, and real-life instructional priorities.

Child characteristics selected for this study included age and gender. Unexpectedly, apart from a weak positive correlation between word length and age, neither Study 3 nor Study 4 provided evidence of any other effects of age or gender on transcription or word-level text generation. This is

contrary to widespread evidence of associations between age or gender and writing attainment (Crawford et al., 2007; DfE, 2017; Medwell et al., 2009). The effects may, however, be complex, for example involving interactions. In consequence, children's age and gender have been included in the more detailed modelling occurring in the current study.

Four factors associated with children's performance were included as potential predictors of compositional quality: T-gen letter counts, T+C-gen letter-counts, handwriting accuracy and spelling accuracy. T-gen and T+C-gen letter-counts were obtained from Study 3. Study 4 showed that while T+C-gen letter-counts were associated with lexical richness, T-gen letter-counts were not. Studies 5 and 6 indicated some possible explanations which might have contributed to these findings. Both T-gen and T+C-gen letter-counts were included in the modelling in the current study in order to investigate and compare their effects in greater depth.

Handwriting and spelling accuracy were scored using a combination of SATs, Assessing Pupils' Progress (APP) and NC criteria (see chapter 3) in schemes developed specifically for Study 7. Handwriting accuracy was not examined in Studies 2-6 but it is included in the current study due to the emphasis placed on it by the teachers who participated in Study 1. Study 4 indicated that the association between spelling accuracy (correct/incorrect) and lexical richness was non-significant. In consequence a more complex assessment with potentially greater sensitivity was used in Study 7, with scores being based on use of spelling strategies specified in APP and NC rather than number of errors.

Overall, Study 7 compared some widely accepted influences on performance (children's age within the school year and gender) with other potential predictors which have not previously been investigated (e.g. teachers' sense of preparedness for handwriting tuition, and letter-counts in different categories of writing environment).

Aim

The aim of Study 7 was to identify predictors of genre-based writing scores of compositional quality from a range of child-level, teacher-level and writing environment-level factors.

Objectives

- (1) To calculate correlations between genre-writing scores and mean word length or frequency.
- (2) To carry out modelling to identify predictors which are significant for each outcome variable (genre-writing scores, genre-writing word length and genre-writing word frequency) and contrast the predictors of the three outcome variables.
- (4) To compare findings with those of Studies 1-6.

11.2 Method

See Chapter 5, method studies 2-7.

11.2.1 Participants

Children: Writing samples from 84 children, including 40 boys (mean age =10.14 years, SD = .25, range 9.67-10.67) and 44 girls (mean age =10.13 years, SD = .30, range 9.50-10.81), were analysed. Children with missing genre-based writing data were excluded (including all children in class 6 since no genre-based tasks were completed during the data collection period). Children with FSM/EAL/SEN were also excluded since predictors of their compositional quality may differ from those without.

Teachers: The 7 class teachers of the participating children.

11.2.2 Data

11.2.2.1 Fixed factors

Teacher-level characteristics

- *Number of years since qualification* (from teacher questionnaire)

Scores for perceived adequacy of training in

- *handwriting tuition* (from teacher questionnaire)

- *handwriting speed promotion* (from teacher questionnaire)

Child-level characteristics

- *age*

- *gender*

Performance variables:

- *Total T-gen letter-count* (obtained from Study 3 findings)

- *Total T+C-gen letter-count* (obtained from Study 3 findings)

Handwriting scores were obtained from genre writing scripts, using a 5 level scheme described in Table 61. This was developed for the current study using criteria derived from the Key Stage 2 NC for handwriting, Assessing Pupils' Progress APP and SATs. It was used instead of Key Stage 2 handwriting marking because most participant teachers felt that the band mark of 2 was too broad to be meaningful.

Table 61 Handwriting accuracy score descriptors

Score	Descriptor
1	Letters incorrectly formed
2	Letters correctly formed with clear ascenders and descenders
3	All words legible. Little confusion of upper- and lower-case
4	Joined writing throughout. Consistent letter size and slope
5	Attractive writing which demonstrates consistency and regularity

- *Spelling scores* were obtained from genre writing scripts using APP marking criteria (summarized in table 62). APP marking is based on strategy use rather than the correct vs. incorrect ratio which was used in Study 4 and also SATs assessments. It was felt that APP scoring provided a more sensitive and appropriate measure. Although spelling is an assessment focus in APP compositional writing, the compositional quality in this study was calculated without the spelling element, in order to enable use of the spelling score as a potential predictor of compositional quality scores.

Table 62 Spelling accuracy score descriptors

Score ¹	Descriptor
1	Usually correct spelling of simple high-frequency words. Phonetically plausible attempts at words with digraphs and double letters
2	Usually correct spelling of high frequency grammatical function words, common single morpheme content/lexical words
3	Correct spelling of some common grammatical function words, common content/lexical words with more than, one morpheme, including compound words
4	Correct spelling of most common grammatical function words, regularly formed content/lexical words, including those with multiple morphemes, most past and present tense inflections, plurals
5	Correct spelling of grammatical function words, almost all inflected words, most derivational suffixes and prefixes, most content/lexical words

¹The expected score range for children in Year 5 is level 3-4.

A summary of the fixed factors included in the modelling are shown in table 63.

Table 63 Fixed factors in modelling of predictors of compositional quality

Level	Factor
Teacher characteristics	Years since qualification Adequacy of training in: - handwriting tuition - promoting handwriting speed
Child characteristics	Age Gender
Child performance variables	Letter-counts: - T-gen - T+C-gen Handwriting accuracy score Spelling accuracy score

11.2.2.2 Random factors

Study 6 indicated variation both between classes and between genres in compositional quality. It was felt that it would not be possible to differentiate between these effects since each genre was used by only one or two classes in the data collection week. It was decided to include a random factor of genre in the current analysis since Olinghouse and Wilson (2013) had demonstrated inter-genre differences in compositional quality.

Genre

The genres included in the current study are described in table 64. It includes those described previously for Study 6 and, additionally, two further genres: instructions and descriptive openings. These were not explored in Study 6 because that analysis incorporated T+C preparation used for genre-writing and there was no data available for instructions and descriptive openings (it is assumed that preparation for these genre-writing tasks took place in the week prior to the data collection). Since preparation is not included in Study 7, just the C-gen genre-writing task itself, it is possible to use data related to instructions and descriptive openings genres in Study 7.

Table 64 Key Stage 2 writing genres

Genre	Examples of genre characteristics
Instructions (for example a recipe)	List of what is needed. Numbered steps. End result included. Direct language, pictures or diagrams
Descriptive openings	Settings and characters: adjectives, adverbs
Newspaper report	Eye-catching title, past tense, third person, events in chronological order, quotations, facts
Non-chronological report	Simple informative title, third person, formal register, technical vocabulary, facts
Persuasive writing	Personal opinion in opening sentence, evidence to back up opinion, present tense, time connectives, rhetorical questions
Narrative retelling	Eye-catching opening, descriptions of setting and characters throughout narrative, build up, cliff-hanger, resolution

11.2.3 Analysis

All distributions bar one (T-gen letter-count, positive skew) were normal. According to Bisharra and Hittner (2012), Pearson correlation is robust to Type 1 errors if the distribution is positively skewed and sample size is sufficient (both as in the current study). In consequence, Pearson correlations were used, with Bonferroni corrections when appropriate. A significance level of $p < .05$ was adopted.

Genre-differences in spelling and handwriting accuracy scores, and T-gen and T+C-gen letter-counts were examined using independent t-tests. Associations between age and handwriting score, and age and spelling score were explored using Pearson correlations.

Associations between genre-writing compositional quality score and genre word length or genre word frequency were investigated using Pearson

correlations. In addition, Pearson correlations were used to examine associations between age and genre-writing compositional quality score, genre word length and genre word frequency. Gender differences in genre-writing scores, word lengths and word frequencies were explored using independent t-tests were carried out to investigate.

The effect-size of an individual predictor is calculated by holding all other predictors constant. However, if there is high collinearity between two or more predictors their impact is not unique and the separate effect-sizes cannot reliably be calculated. Effects of collinearity were reduced by standardizing the factors, which reduces collinearity due to scaling (Cohen, West, & Aiken, 2014). The extent of multicollinearity amongst the predictor variables was checked using the condition number statistic which detects linear dependence between factors. Values of 12 or less are acceptable (Baayen, Davidson, & Bates, 2008; Belsley, Kuh, & Welsch, 2004).

Modelling

The analyses continued using multilevel modelling (MLM) using the lme4 package (Bates, Mächler, Bolker, & Walker, 2015). MLM was used because it takes into account variation occurring because data is clustered, for example there may be less variation in writing scores within genres than between them. Unless this random variation is considered there is a risk of finding effects to be significant when they are simply due to random noise. The random variation can be taken into account in MLMs by specifying random effects and on the slopes of the effects of the variables. MLM allows all these factors to be computed simultaneously.

Three analyses were carried out. The main analysis was to identify significant predictors of genre writing score. The second and third sets followed the same procedures except that the dependent variables were respectively word length and word frequency.

Successive models were compared using the Likelihood Ratio Test (LRT, Baayen et al., 2008; Barr, Levy, Scheepers, & Tily, 2013; Pinheiro & Bates, 2000). For each analysis, the first model included only random effects to allow for clustering of variance. Following this the main effects of the fixed factors were added. The next stage was calculation of any interactions between main effects. Subsequently justification for the inclusion of random effects was investigated by excluding them and determining whether fit was better with or without the effect using the LRT. If random effects failed to improve fit, suggesting that the data was not clustered, the analysis continued using multiple regression.

If multiple regression was required the same potential predictors were used. Models were compared using adjusted R^2 . Once the model with the highest R^2 was identified, the Durbin Watson test was carried out to establish whether the residuals were significantly correlated. Significant outliers were identified and the reasons investigated. Beta values and 95% confidence limits were calculated. In addition, diagnostic plots were created to estimate how well the model represented the data.

11.3 Results

11.3.1 Fixed Factors

11.3.1.1 Teacher-level

Table 65 shows mean values, standard deviations and ranges for the three teacher-level factors. Teachers ranged from feeling inadequately prepared to teach handwriting through to well-prepared. No teachers felt well-prepared for promotion of handwriting speed (see Study 1 interviews). There was a 15 year range in years since qualification. No teachers were newly qualified.

Table 65 Teacher fixed factor scores

Teachers	Mean	SE	Min	Max
Years since qualification ¹	12.74	5.2	5	20
Perceived adequacy of training in handwriting tuition ²	3.13	1.56	1	5
Perceived adequacy of training in promotion of handwriting speed	1.58	.80	1	3

¹ Years since qualification data was obtained from the teacher interviews

² Training data was obtained from the teacher questionnaires (see Appendix G)

11.3.1.2 Child-level

Table 66 shows mean values, standard deviations and ranges for all children and also separated by gender.

Table 66 Child fixed factor scores

	All participants				Boys (N = 40)				Girls (N = 44)			
	Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	max
Age	10.13	.27	9.50	10.81	10.14	.25	9.67	10.67	10.13	.30	9.50	10.81
Letter counts												
T-gen	407	.91	75	1811	430	353.0 0	118	1811	386	292.2 4	75	1378
T+C-gen	1211	321.3 5	66	3843	1105	1049. 42	66	3487	1307	949.9 0	207	3843
Transcription												
Hand-writing ¹	3.29	.91	1	5	3.08	.90	1.5	5.0	3.48	.88	1.0	5.0
Spelling ²	3.30	.74	1	5	3.39	.74	2.0	5.0	3.22	.75	1.0	4.5

¹ See table 61 Handwriting accuracy score descriptors

² See table 62 Spelling accuracy score descriptors

Independent t-tests were carried out to compare boys and girls' genre-writing spelling and handwriting scores, and T-gen and T+C-gen letter-counts. There was no gender difference for genre-writing spelling score ($p = .294$). There was a significant difference for genre-writing handwriting scores with girls achieving higher scores ($t(82) = 2.07, p = 0.041$). There were no significant gender differences for T-gen letter-count ($p = .542$) and T+C-gen letter-count ($p = .358$).

Associations between age (all participants), handwriting score and spelling score were calculated using Pearson correlations with Bonferroni corrections ($p < .017$). Age was weakly positively correlated with spelling score ($r = .26, p = .009$) whereas the correlation with handwriting score was non-significant ($p = .036$). There was a moderate positive correlation between handwriting and spelling score. ($r = .60, p < .001$). There were non-significant correlations between age and T-gen letter-count ($p = .889$), and age and T+C-gen letter-count ($p = .556$).

11.3.1.3 Outcome variables: Genre-writing, and genre word length and frequency

Table 67 shows children's scores in genre-writing. Word length and frequency are also included in order to compare predictor effects.

Table 67 Mean values, standard scores and ranges for genre-writing score, genre word length and genre word frequency

	All participants				Boys (N = 40)				Girls (N = 44)			
	Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	Max
Genre-writing score	6.71	1.84	2	11	6.57	2.11	2	11	6.84	1.57	4	10
Genre-writing word length	4.65	.38	3.31	5.84	4.62	.47	3.31	5.48	4.69	.26	4.06	5.22
Genre-writing word frequency	11.89	.56	10.80	13.52	11.88	.68	10.80	13.52	11.89	.43	10.99	12.67

Independent t-tests were carried out to investigate gender differences. None were significant (genre-writing : $p = .512$, word length: $p = .453$, word frequency: $p = .891$).

Pearson correlations were calculated between genre-writing compositional quality score and genre word length or genre word frequency, using a Bonferroni correction ($p < .017$). There was a positive correlation between genre writing score and genre word length ($r = .59$, $p < .001$) and a negative correlation between genre writing score and genre word frequency ($r = -.61$, $p < .001$).

Pearson correlations were calculated between age and genre-writing compositional quality score and genre word length or genre word frequency for all children, using a Bonferroni correction ($p < .017$). None were significant: age and genre-writing score ($p = .035$), age and genre word length ($p = .031$), age and genre word frequency ($p = .046$).

Figure 14 compares genre-writing scores, word lengths and frequencies across genres. The genres are ordered according to genre-writing score, ranging from instructions (lowest) to non-chronological report (highest). Word lengths tended to increase and word frequencies decrease as genre-writing score rose.

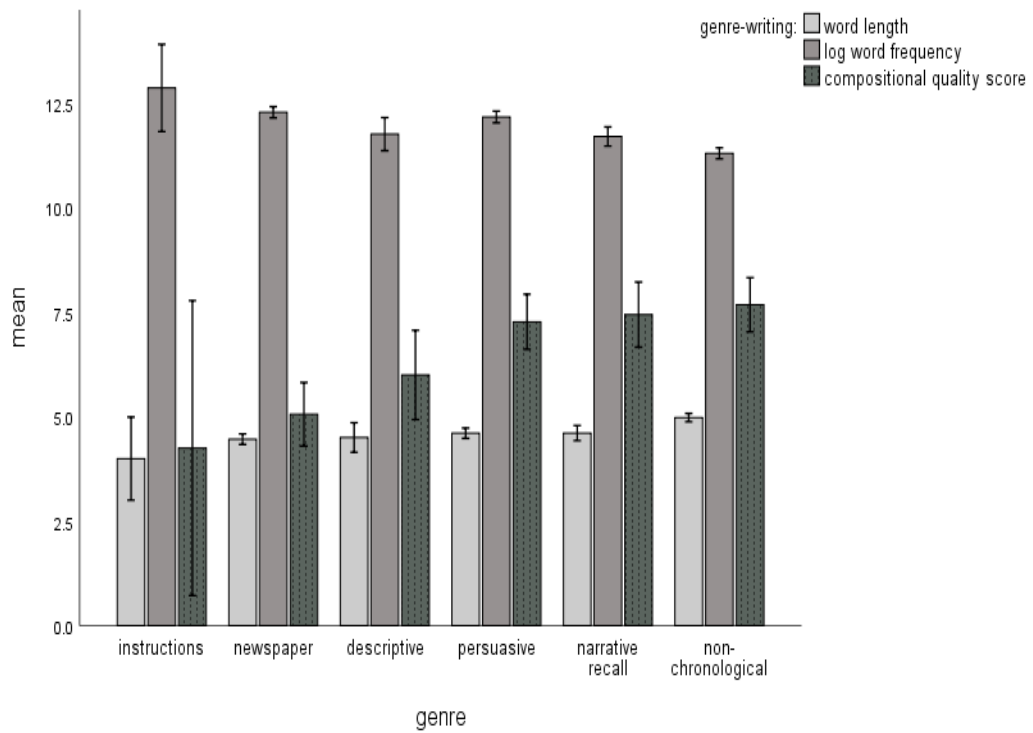


Figure 14 Comparison of compositional quality scores, word length and word frequency between genres

11.3.1.4 Genre comparison: compositional quality score, word length and word frequency

Table 68 shows overall means and minimum and maximal scores for individual genre-writing tasks, and word length and word frequency for each genre.

Table 68 Comparison between genre-based scores for writing, genre word length and frequency in each class

	Instructions (N = 4) Class 1				Newspaper report (N = 17) Classes 2 and 8			
	Mean	SD	min	max	Mean	SD	min	max
Genre-writing score	4.25	2.22	2	7	5.06	1.48	2	8
Word length	4.00	.63	3.31	4.73	4.46	.24	3.84	4.74
Word frequency	12.87	.66	12.04	13.52	12.29	.26	11.93	12.77
	Non-chronological report (N = 25) Classes 3 and 4				Persuasive writing (N = 22) Class 5			
	Mean	SD	min	max	Mean	SD	min	max
Genre-writing score	7.68	1.58	5	11	7.27	1.49	4	9
Word length	4.98	.24	4.53	5.48	4.61	.28	4.06	5.02
Word frequency	11.30	.32	10.80	12.07	12.17	.32	11.70	12.61
	Narrative retelling (N = 9) Class 7				Descriptive opening (N = 7) Class 7			
	Mean	SD	min	max	Mean	SD	min	max
Genre-writing score	7.44	1.01	7	10	6.00	1.16	5	8
Word length	4.61	.24	4.28	5.04	4.50	.38	4.19	5.16
Word frequency	11.71	.30	11.25	12.05	11.76	.43	11.16	12.23

11.3.1.5 Correlations between variables

Table 69 shows a correlation matrix including all predictor and outcome variables. Collinearity values were calculated for each of the three analyses (genre-writing score, genre word length and genre word frequency, using the Collin Function (Belsley et al., 2004). Following standardization of the factors, all were acceptable (< 12).

Table 69 Correlation matrix including potential predictors and outcome variables

	Genre-writing score	Genre-writing mean word length	Genre-writing mean word frequency	Child age	Child gender	Years since qualification	Adequacy of training in handwriting tuition	Adequacy of training in handwriting speed promotion	T-gen letter-count	T+C-gen letter-count	Spelling score
Genre-writing mean word length	.59***										
Genre-writing mean word frequency	-.61***	-.81***									
Child age	.24*	.24*	-.22*								
Child gender	.07	.08	.02	-.02							
Years since qualification	-.34**	-.36***	.35**	-.27*	.03						
Handwriting tuition training adequacy	-.18	-.01	-.07	-.17	-.15	.71***					
Handwriting speed promotion training adequacy	-.25*	.05	.02	.00	-.23*	-.10	.43***				
T-gen letter-count	.06	.10	-.12	.03	-.07	-.50***	-.52***	-.04			
T+C-gen letter-count	.44***	.37***	-.55***	.07	.10	-.15	-.21	-.56***	.30**		
Spelling score	.56***	.47***	-.45***	.28**	-.12	-.18	-.05	-.12	.24*	.41***	
Handwriting score	.56***	.44***	-.52***	.23*	.22*	-.31**	-.18	-.23*	.21	.48***	.60***

p values: <.05 *, <.01 **, <.001 ***

11.3.2 Modelling results

11.3.2.1 Genre-writing score

A random effect of genre was justifiable, implying that genre-disparity is responsible for a significant proportion of the overall variability, i.e. effect sizes vary between genres. Table 70 shows the final model.

Table 70 Genre-writing score, final MLM model

N = 84	Estimate	SE	t	p	Confidence limits	
					2.5%	97.5%
<i>Fixed effects: significant</i>						
Intercept					5.91	7.47
T+C-gen letter-count	0.64	0.22	2.89	0.006	0.21	1.08
Interaction: age x spelling score	-0.38	0.14	-2.73	0.008	-0.65	-0.11
Interaction age x handwriting score	0.46	0.17	2.64	0.010	0.12	0.79
Years since qualification	-1.02	0.39	-2.61	0.013	-1.78	-0.26
Adequacy of training in handwriting tuition	0.82	0.34	2.42	0.020	0.15	1.48
Spelling score	0.35	0.17	2.02	0.047	0.01	0.68
Handwriting score	0.34	0.17	2.00	0.049	0.01	0.68
<i>Fixed effects: non-significant</i>						
Age	0.15	0.15	1.011	0.315	-0.14	0.43
<i>Random effects</i>						
Genre		Variance	SD			
	Intercept	0.76	0.87			
Residual	Intercept	1.17	1.08			

Children who gained higher genre-writing scores had higher T+C-gen letter-counts, and higher spelling and handwriting scores. Their teachers were more recently qualified and felt adequately trained in handwriting tuition (see partial plots in figure 15).

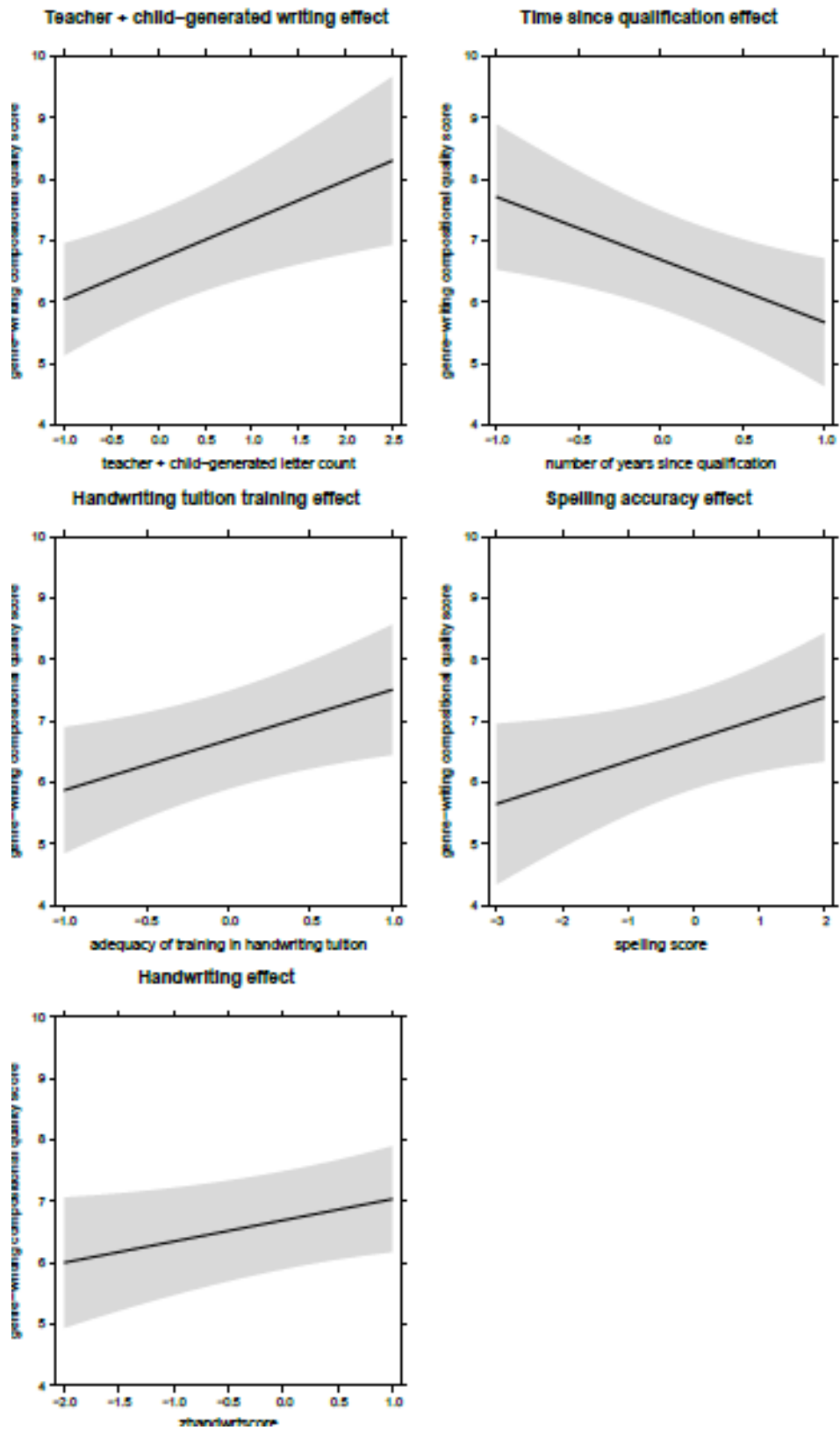


Figure 15 Genre-writing scores: partial effects plots of significant main effects

Interactions

There was an interaction between age and spelling accuracy scores. Amongst older children, genre-writing scores appeared to be little influenced by spelling scores. For younger children there was a positive association between spelling accuracy and genre-writing score, and the lowest writing scores were achieved by children who were both young and had lower spelling accuracy.

There was also an interaction between age and handwriting scores, Amongst older children, there was a positive association between writing scores and handwriting scores with the highest scores achieved by children who were both old and with high handwriting scores. In contrast, for younger children writing scores appeared little influenced by handwriting scores.

11.3.2.2 Genre-writing word length

MLM indicated that it was not justifiable to include random effects. As a result the modelling changed to multiple regression. The results of the final model indicated that 47% of the variance had been explained ($F(8,75) = 10.26, p < .001$). Table 71 shows the final model.

Table 71 Genre word length, final multiple regression model

Multiple $R^2 = 0.52$ Adjusted $R^2 = 0.47$ N = 84	b	SE	t	p	β	Confidence limits	
						2.5%	97.5%
<i>Significant</i>							
Years since qualification	-0.36	0.08	-4.82	<.001	-0.96	-0.51	-0.21
Adequacy of training in handwriting tuition	0.33	0.09	3.59	<.001	0.88	0.15	0.51
Spelling score	0.11	0.03	3.25	.002	0.30	0.04	0.18
Interaction: years since qualification x T-gen letter-count	0.09	0.04	2.14	.036	0.24	0.01	0.17
Gender	0.15	0.06	2.38	.020	0.20	0.02	0.28
<i>Non-significant</i>							
T+C-gen letter-count	0.10	0.05	1.90	.061	0.26	-0.00	0.20
Adequacy of training in handwriting speed promotion	-0.12	0.08	-1.63	.107	-0.33	-0.27	0.03
T-gen letter-count	0.03	0.05	0.62	.539	0.08	-0.07	0.13

Children who wrote with the greatest compositional quality were taught by more recently qualified teachers who felt that they had received adequate training in handwriting tuition. These children had higher spelling scores and were female (see partial plots in figure 16).

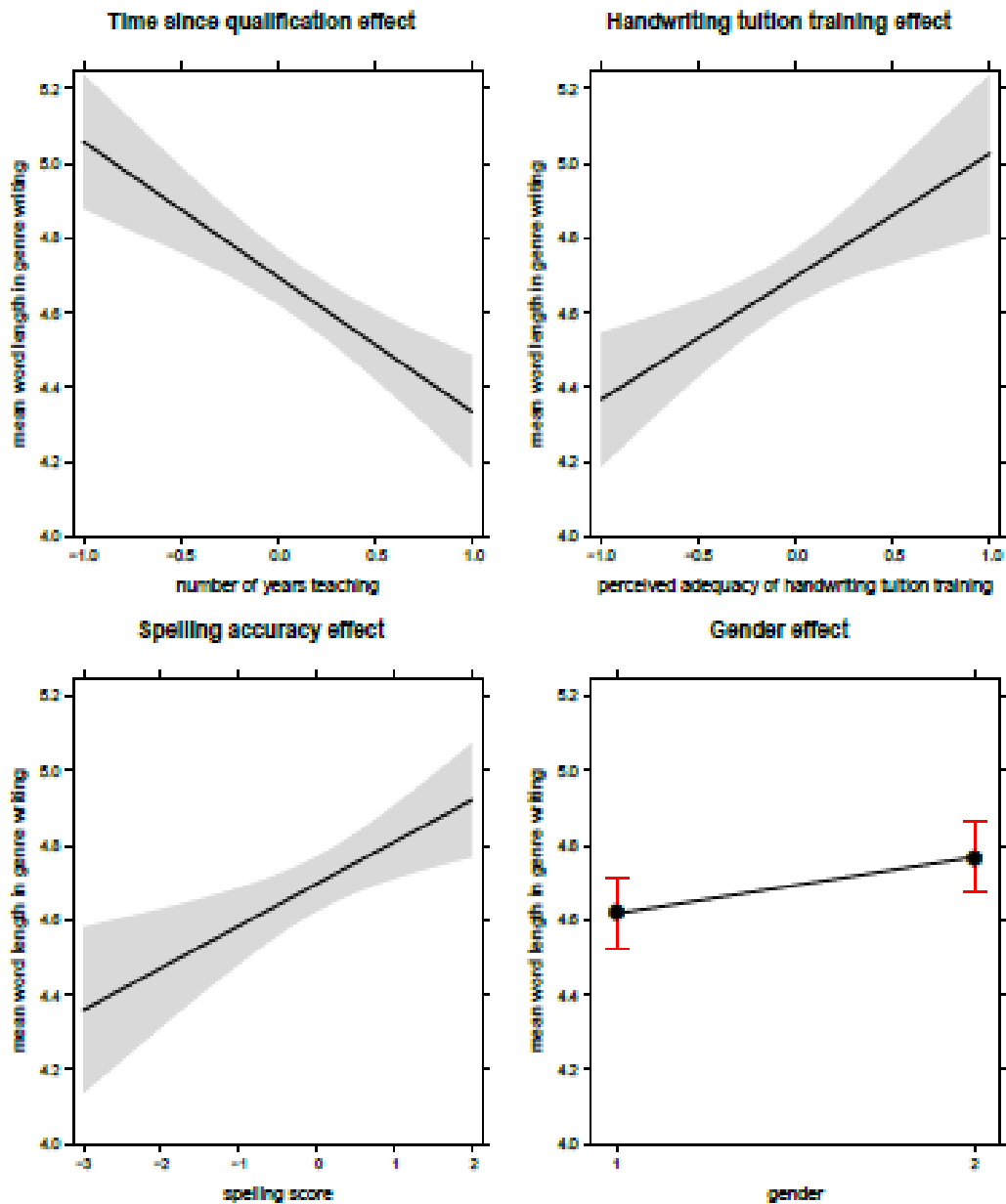


Figure 16 Genre word length: partial effects plots of significant main effects

There was an interaction between years since teacher qualification and T-gen letter-count. Amongst children with larger T-gen letter-counts there was a minimal effect of years since qualification on word length. For those with the lower T-gen letter-counts, as years since qualification increased there was a decrease in word length. The implications are that the more recently qualified teachers who used less T-gen writing used longer words when asking children to copy.

11.3.2.3 Genre-writing word frequency

MLM indicated that it was not justifiable to include random effects. As a result the modelling changed to multiple regression. Table 72 shows the final model. The results of the final model demonstrated that 72% of the variance was explained ($F(11,72) = 18.56, p < .001$).

Table 72 Genre word frequency, final multiple regression model

Multiple $R^2 = 0.76$ Adjusted $R^2 = 0.72$ N = 84	b	SE	t	p	β	Confidence limits	
						2.5%	97.5%
<i>Significant</i>							
Adequacy of training in handwriting tuition	-0.69	0.08	--8.19	<.001	-1.23	-0.86	-0.52
Years since qualification	0.68	0.08	8.19	<.001	1.21	0.51	0.84
Adequacy of training in handwriting speed promotion	0.28	0.07	3.87	<.001	0.50	0.14	0.42
T+C-gen letter-count	-0.27	0.06	-4.21	<.001	-0.48	-0.40	-0.14
Interaction: T+C-gen letter-count x gender	0.19	0.08	2.44	.017	0.34	0.03	0.34
<i>Non-significant</i>							
Interaction: handwriting score x gender	-0.10	0.08	-1.26	.211	-0.18	-0.26	0.06
Interaction: handwriting score x age	-0.09	0.05	-1.89	.063	-0.16	-0.18	0.00
Interaction: spelling score x age	0.05	0.04	1.22	.225	0.08	-0.03	0.12
Gender	-0.09	0.07	-1.16	.250	-0.08	-0.23	0.06
Handwriting score	0.05	0.07	0.66	.509	0.08	-0.09	0.19
Age	-0.03	0.04	-0.80	.426	-0.05	-0.11	0.05
Spelling score	-0.03	0.05	-0.55	.582	-0.05	-0.12	0.07

Children who used lower-frequency words in genre-based writing were taught by teachers who were more recently qualified and felt that they had received adequate training in handwriting tuition. However, their teachers also felt that they had received insufficient training in handwriting speed promotion. In addition, children who used lower-frequency words tended to have higher T+C-gen letter-counts (see figure 17).

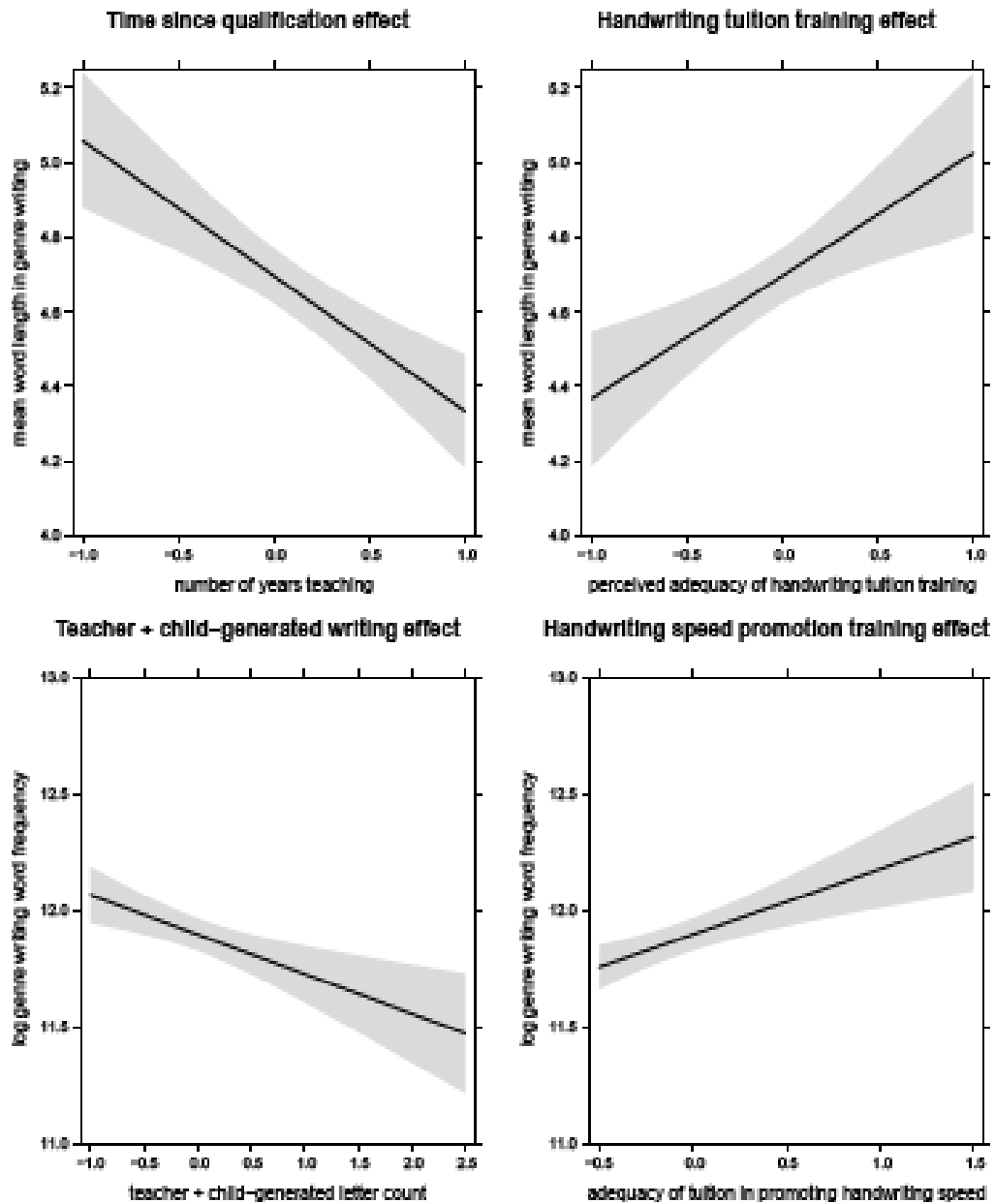


Figure 17 Genre word frequency: partial effects plots of significant main effects

There was an interaction between T+C-gen letter-count and gender. For both boys and girls, word frequency in genre-based writing was lower if T+C-gen letter-count was greater. However, this effect was stronger for boys; word frequencies were lowest amongst boys with greatest T+C-gen letter-count and highest for boys with the smallest T+C-gen letter-count.

Diagnostic testing

Diagnostic testing of the regression analyses took place using the Durbin Watson test. It was found that two children (22 and 48) were outliers for word length and frequency in their genre writing. These children were excluded and the analyses re-run as a sensitivity analysis. Diagnostic testing of the analyses demonstrated that, following exclusion of two participants, the regression assumptions were met. The results including and excluding these children were as follows:

Word length

N = 82: Multiple $R^2 = 0.56$, Adjusted $R^2 = 0.50$, ($F(9,72) = 10.00$, $p < .001$)

N = 84: Multiple $R^2 = 0.52$, Adjusted $R^2 = 0.47$, ($F(8,75) = 10.26$, $p < .001$)

Word frequency

N = 82: Multiple $R^2 = 0.78$, Adjusted $R^2 = 0.74$, ($F(13,68) = 19.01$, $p < .001$)

N = 84: Multiple $R^2 = 0.76$, Adjusted $R^2 = 0.72$, ($F(11,72) = 18.56$, $p < .001$)

11.3.2.4 Comparison between analyses for compositional quality of genre-writing, genre-writing word length, and genre-writing word frequency

Table 73 summarizes the modelling results for multilevel modelling and multiple regressions for N = 82 for the three outcomes of interest (genre-writing scores, word length and word frequency). The effect directions are consistent for every factor across each outcome variable (and consistent with the N = 84, which is not reported in Table 73).

Three main effects were significant for all three outcomes: years since teacher qualification, sufficient tuition in teaching handwriting and T+C-gen letter-count. Children who achieved higher genre-writing scores, and used longer and lower-frequency words, tended to have teachers who were more recently qualified and had received sufficient handwriting training, and had higher T+C-gen letter-counts. In addition, those with more accurate spelling achieved higher genre-writing scores and used longer words. As well as main effect of spelling accuracy for genre-writing scores, age, spelling and handwriting scores interacted, such that younger children's genre-writing scores were more linked with spelling accuracy whereas older children were more linked with handwriting competency. The remaining main effects and interactions are shown in table 73.

Table 73 Comparison of all significant main factors and interactions in analyses of predictors of genre writing scores, genre word lengths and genre word frequencies
(t values for MLM, β values for Multiple Regression)

N = 82	Genre writing score	Genre-writing word length	Genre-writing word frequency
Main effects			
Years since qualification	Main effect: t = -2.51	Main effect: β = -0.88	Main effect: β = 1.27
Adequacy of training in writing tuition	Main effect: t = 2.48	Main effect: β = 1.05	Main effect: β = -1.38
T+C-gen letter-count	Main effect: t = 2.55	Main effect: β = 0.42	Main effect: β = -0.88
Spelling score	Main effect: t = 2.48	Main effect: β = 0.28	ns
Gender (girls: longer words)	ns	Main effect: β = 0.19	ns
Teacher training in speed promotion	ns	ns	Main effect: β = 0.54
Interactions			
Spelling score x age	t = -2.48		
Handwriting score x age	t = 2.96		
Adequacy of training in writing tuition x T-gen letter-count		β = 0.33	
T+C-gen letter-count x gender			β = 0.30

11.4 Discussion

This study examined predictors of genre-writing compositional quality writing scores, selected on the basis of findings in Studies 1-6. As well as factors widely agreed in the literature to predict compositional quality (children's age, gender and spelling accuracy), variables not previously investigated as predictors (e.g. perceived adequacy of training in handwriting tuition) and novel variables (such as writing environment letter-counts) were incorporated. In addition, a possible random factor of genre was included since writing scores may be influenced by genre. Predictors of word length and word frequency were also examined as secondary analyses.

Key findings

The strongest positive predictors of children's genre-writing compositional scores were more recent teacher qualification, teachers feeling well prepared for handwriting tuition and larger T+C-gen letter-counts. The predictors for word length and frequency were found to be very similar to those for genre-writing compositional scores, although while there was a random effect of genre for compositional score it was not justifiable for either word length or frequency.

There was a moderate positive correlation between genre writing score and genre word length, and a moderate negative correlation between genre-writing score and genre word frequency. This was reflected in the comparison between writing genres: higher mean genre writing scores were linked with longer words and lower word frequencies.

Additional findings were associated with age, handwriting, spelling and gender. For genre-writing scores, there were interactions between age and handwriting score, and age and spelling score. Highest genre-writing compositional quality scores were achieved by children who were both older and had higher handwriting scores. The lowest were achieved by

younger children with low spelling scores. Spelling accuracy also predicted word length, with girls using longer words.

There was also a gender interaction for word frequency. For both boys and girls, word frequency was lower if T+C-gen letter-count was greater. However, this effect was stronger for boys; word frequencies were lowest amongst boys with greatest T+C-gen letter-count and highest for boys with the smallest T+C-gen letter-count.

11.4.1 Teacher experience and preparedness for writing tuition

Pupils of more recently qualified teachers gained higher writing scores. A possible explanation for this unexpected finding, commented upon in Study 1 (teacher interviews) was the effect of teacher beliefs and the prevailing teaching philosophy at the time of qualification (Ball, 2003). More recently qualified teachers have been trained in an environment which judges teaching effectiveness through results, rather than relying on teacher experience. In contrast, those less recently qualified appeared to regard teacher beliefs as of greater importance than scoring performance through, for example, Ofsted gradings. It should, however, be remembered that the teachers who participated in this project who were less recently trained were also employed at schools which received lower Ofsted gradings. These schools might have been characterised by lower levels of staff engagement, perhaps stemming from a lack of pro-active head-teacher leadership. Possible consequences are reduced teaching effectiveness and lower levels of child attainment. These factors could be addressed in future studies with larger numbers of teacher participants with a range of years of teaching experience, and schools with a range of Ofsted grades.

Teacher's sense of preparedness for teaching writing predicted compositional quality in genre-writing, though preparedness for promoting handwriting speed appeared to be less significant. In general the teachers participating in the current study felt that their training requirements had been more closely met than those in the surveys reviewed in chapter 2 (e.g.

Barnett et al., 2006; Graham, Harris, et al., 2008). The contrasting finding for sense of preparedness for promotion of handwriting speed may to some extent be affected by teachers' recognition of the relative benefits of more rapid vs. neater handwriting. Those who felt adequately prepared for promoting speed may simply have been satisfied with little training in this area because they did not place much value on the rapidity of writing. This might be a consequence of lack of provision of enough knowledge of handwriting and writing theoretical frameworks in initial training or INSET to enable informed decision-making about classroom practice. There may also be amplification by an educational environment in which handwriting neatness/accuracy is highly regarded (Barnett et al.) and, furthermore, it is handwriting accuracy rather than speed which is assessed in Key Stage 2 SATs.

These comments are based on only small number of teachers. There are several ways of investigating the findings in more depth. For example, inclusion of open questions related to training in handwriting tuition and promotion of handwriting speed in the Study 1 interviews might have clarified interpretation of teacher beliefs regarding teacher training. Secondly, a focus group might clarify teachers' opinions about the importance of handwriting speed. This would facilitate design of a survey investigating beliefs about the relative importance of aspects of writing such as speed, neatness, accuracy (of letter formation and joining) and legibility in predicting compositional quality. As discussed above, inclusion of a larger sample size in future studies would also be beneficial.

11.4.2 Letter counts

As anticipated from Study 4 findings (transcription and word-level text generation), the current study showed that T+C-gen letter-count predicted genre-writing score whereas T-gen letter-count did not. A specific intention of T+C-gen writing is the introduction of novel/unfamiliar vocabulary. Graham and Harris (2017) demonstrated that explicit teaching, which incorporates T+C-gen writing, provided highly effective tuition for

vocabulary acquisition. Study 6 indicated that a third of topic-relevant word-types used in preparation for genre-writing tasks were used in the genre-writing itself. In the absence of comparable studies it is difficult to evaluate this finding, but Dockrell et al. (2016) emphasised the importance primary school teachers attach to word-level work.

Copying is likely to be cognitively demanding for most children throughout primary education (Castles et al., 2007; Chartrel & Vinter, 2006; Laishley et al., 2015; Palmis et al., 2017; Plamondon et al., 2013; Pontart et al., 2013) and working memory limitations and immature letter-position encoding skills may result in shallower processing of novel/unfamiliar vocabulary. There were no significant main effects of amount of T-gen writing for either genre-writing quality, or its lexical richness (reflecting Study 4 findings). This suggests that learning of word meanings through copying might be less effective than when the vocabulary is encountered in a T+C-gen writing environment.

Vocabulary learning was not tested in the current project, but the findings suggest that further investigation would be beneficial. For example, word writing requires a deeper understanding of meaning than word recognition (Durso & Shore, 1991; Wesche & Paribakht, 1996). Testing word recognition and expressive use following copying or T+C-gen teaching would provide information of the relative efficiency of these writing environments in promoting vocabulary learning. This would require measurement of previous knowledge of the words. In Dodds and Kearns (2016) children were taught 25 academic words and were then encouraged to use them in self-generated writing, but this study was limited by the lack of testing of prior familiarity with these words.

11.4.3 Spelling and handwriting

There were significant main effects associated with spelling skills for genre-writing score and mean word length. One explanation is that children with less well-developed spelling skills were likely to rely on serial transcription

of letter sounds i.e. using a non-lexical processing route (Marinelli et al., 2015), which is cognitively a more demanding process than lexical processing. The consequently reduced availability of working memory would appear likely to compromise compositional quality (Berninger & Winn, 2006) as well as generating the word length effects described in Laishley et al. (2015). Frequency effects are considered to be associated long-term orthographic memory rather than working memory; the lack of a significant main effect of spelling skills on mean word frequency may be a consequence of the smaller additional burden which is placed on working memory. Alternatively, children who find spelling difficult may compensate by selecting only words which they are confident they can spell correctly.

With regard to handwriting, consistent with Medwell et al. (2009), handwriting score was a weak but significant predictor of genre-based writing score, although not of word length or frequency. Only a maximum of three marks (out of 50) is allotted to handwriting in SATs, awarded principally for legibility and joining. Several teachers commented in their Study 1 interviews that this militated against focussing on handwriting tuition. Nonetheless, most appeared to prioritise handwriting neatness. Previous work has demonstrated that quality of composition is predicted by handwriting automaticity or speed (Graham et al., 1997) but these variables were not included in the current project. ameliorating

Overall, in order to achieve a high writing score, children needed a relatively high level of competency in handwriting – highest scores being achieved by children who were both older and had higher handwriting marks whereas for younger children, writing scores appeared little influenced by handwriting marks. In contrast, for spelling scores the oldest children were no longer limited by spelling score in terms of writing score whereas the converse was true for younger children.

Spelling assessment in primary school adopts two different procedures, i.e. correct/incorrect in SATs spelling testing vs. use of spelling strategies in Assessing Pupils' Progress (APP). The methodology of scoring spelling skills in the current study may have influenced the findings, and further research in this area would be appropriate in order to compare scoring systems.

11.4.4 Gender

Main gender effects were not evident in genre-writing scores or word frequency, although they were for word length, with girls using longer words. There was also an inverse relationship between word frequency and T+C-gen letter-count which was more marked for boys than girls. Children with the lowest mean word frequency tended to be boys with high T+C-gen letter-counts. Conversely, children with the highest mean word frequency tended to be boys with low T+C-gen letter-counts.

This word frequency finding may be associated with gender distributions. Ranges for participating boys' word-lengths and word-frequencies, letter-counts and spelling error-rate all exceeded those of girls. Bhattacharyya et al. (2003) identified that some groups of boys (for example low SES white boys) have conspicuously low levels of writing attainment. However, despite the greater ranges demonstrated by boys in this project, the tail-end effect demonstrated by Bhattacharyya et al. was not evident. This may be a consequence of the lack of participants from low SES backgrounds. It would be valuable to repeat this study in different contexts, for example in schools with greater SES variation or lower SES students.

11.4.5 Age

There is widespread evidence that children's relative age within the school year is associated with academic achievement, attainment of children who are older in the school year tends to be higher (Crawford et al., 2007). Age was not, however, associated with transcription skills or lexical richness of writing in Studies 3 and 4. Despite this, the modelling carried out in the

current study demonstrated significant effects of age but only in interactions with handwriting and spelling accuracy.

Handwriting and spelling skills are in competition for the limited reserve of working memory upon which both draw (McCutchen, 1996). The genre-writing score for younger participants in the current study appeared to be constrained more by spelling rather than handwriting accuracy. However, for older children, genre-writing scores appear to be influenced more by handwriting skills than spelling. The age interaction findings may, however, be an artefact of factors such as the limited age range of the participants or effectiveness of handwriting or spelling instruction. Further studies involving a wider age range would illuminate the finding of the current study

11.4.6 Genre

The exploratory analysis in Study 6, in which there were four writing genres, suggested inter-genre variation in score. Other studies (e.g. Olinghouse & Leaird, 2009; Olinghouse & Wilson, 2013; Vera, Sotomayor, Bedwell, Dominguez, & Jeldrez, 2016) have identified that writing quality scores vary across genres, and have also shown that compositional quality in each genre is predicted by different measures of lexical richness. In addition, in their investigation of genre-writing scoring, Bower, Béguin, Sanders, and van den Bergh (2015) found that while writer accounted for only 10% of the variance in compositional scores, genre accounted for 11% (remaining variance being attributed to interactions between the writer, genre, writing task, and rater).

Six genres were incorporated into the current study, and it was found justifiable to include a random effects of genre on compositional quality score. A significant random effect of genre implies that the magnitude of a given fixed effect on compositional quality, for example, number of years since teacher qualification, varied within the sample of genres (rather than between specific genres). Unlike genre-writing, it was not justifiable to include a random effect of genre in the analysis of predictors of word length

or frequency, i.e. it did not increase accuracy of model fit. Together, these suggest that the random effect of genre in predicting genre-writing score might be associated with elements not restricted to lexical richness. Study 6 (vocabulary learning in preparation for genre-writing tasks) suggested that the experience of T+C-gen writing during preparation for genre-writing was associated with higher scores, whether or not individual word-types were subsequently used in the genre-writing itself. Part of the reason for the benefit of this experience may have been associated with tuition in higher-level writing skills including, for example, genre-knowledge and planning. These elements of tuition may have provided the random variation in genre-writing scores.

As discussed in Study 6, the extent of overlap between class, genre, and preparation for genre-writing was sufficient that it was not possible to analyze these factors simultaneously. Interpretation of findings is consequently difficult and an experiment involving a larger number of genres, genre-writing preparation, and classes would be necessary before it was justifiable to draw conclusions. Furthermore, as discussed in Study 6, although there is considerable evidence that explicit instruction in a wide range of writing skills is an effective intervention for improving composition skills and knowledge acquisition cross-curriculum, little is known about the effectiveness of other forms of T+C-gen writing. In consequence it is not yet possible to evaluate the validity of including all writing activities within the T+C-gen writing environment in a single category.

11.5 Key points and conclusions

There were three principal findings in the current study. Firstly there was an inverse relationship between years since teacher qualification and genre-writing score, possibly attributable to changes in teacher beliefs since performativity has come to be emphasised. Secondly, there was a significant positive effect of participants' perception of adequacy of training in handwriting tuition on genre-writing score. This is consistent with

McCutchen's (1996) capacity theory of writing; if children receive effective tuition in handwriting skills, working memory resources are likely to become available for higher-level processing in writing. Thirdly, the amount of T+C-gen writing (but not T-gen writing) predicted compositional quality. A possible explanation is that T+C-gen writing may provide access not only to deeper processing of novel/unfamiliar vocabulary but also non-vocabulary related elements in the form of tuition in higher-level processing in writing. Implications of this study are considered in chapter 13: General Discussion.

12 GENERAL DISCUSSION

Introduction

The purpose of this PhD project was to investigate the interrelationships between teacher perspectives on writing tuition, associations between transcription and text generation, the relative impacts of different writing environments, and predictors compositional quality in genre-based writing. It took place in a naturalistic classroom setting and all written work was a product of normal classroom activities.

This general discussion chapter initiates with key findings from each of the seven studies. Next four principal themes are explored: 1) Provision: NC, school policies and teachers vs. models of motor learning, 2) Teacher experience, beliefs and training, 3) Handwriting skills and the promotion of compositional quality, and 4) Writing environments and text generation.

Theoretical and practical implications of the findings are considered. Subsequently limitations of the studies individually and the PhD as a whole are examined, and how the work might be built on and developed in the future. Finally an overall conclusion is put forward.

12.1 Key findings

Study 1 Do teacher-beliefs, training and classroom practice reflect evidence-based recommendations for writing tuition?

The NC for handwriting was considered vague. The greater emphasis on transcription and grammar in the new NC was regarded more positively by those comparatively recently qualified. Teachers at the schools with

recently reviewed handwriting policies and those qualified less long had a high sense of policy ownership. Two-thirds of the participants considered they had received adequate training in handwriting tuition.

All of the participants felt that there should be handwriting tuition at primary school with only one considering that it should stop before upper Key Stage 2. Nevertheless, only one class received the amount of tuition which has been recommended. Most of the teachers discussed memory overload during writing. Almost all felt that handwriting speed contributed more to compositional quality than its neatness but only one actively promoted handwriting speed with most emphasising neatness. No teachers referred directly to evidence-based teaching recommendations.

Study 2 An examination of classroom writing environments

Almost all T-gen writing was copied from class whiteboards and the most common activity was writing headings. In T+C-gen writing, vocabulary was introduced by teachers and then used by children in self-generated sentences, with teacher scaffolding as necessary. T+C-gen writing occurred during, for example, explicit teaching or note-taking and was typically when children were preparing for genre-writing tasks or used in science. C-gen writing ranged from word-level to multi-paragraph writing. All multi-paragraph writing was genre-based.

Study 3 Handwriting and spelling characteristics of written output

There was a 16-fold difference between numbers of letters written by the most and least productive children and mean number of letters written in the most productive class was five times that in the least productive. Overall, 17% of writing was T-gen, 40% T+C-gen and 43% C-gen. High output classes tended to produce a greater proportion of T+C-gen and C-gen writing than T-gen writing.

Study 4 Links between transcription and word-level text generation

Although there was a significant positive relationship between lexical richness of C-gen writing and T+C-gen letter-count, the association with T-

gen letter-count was non-significant. In addition, there were no significant associations between C-gen lexical richness and spelling error percentage in any writing category.

Study 5 Spelling strategies in copied and C-gen writing

The percentage of phonologically plausible spelling errors was significantly higher in child-generated writing than in copied writing. The reverse was the case for errors which were phonologically implausible.

Study 6 Transferring vocabulary from classroom learning to genre-writing

There were significant positive correlations between genre-writing scores and numbers of either word-types or topic-relevant word-types encountered in preparation for the genre-writing tasks. There were similar associations for numbers of word-types or topic-relevant word-types which were used in both preparation for the genre-writing tasks and the tasks.

Study 7 Predictors of the compositional quality of genre-writing

The strongest predictors of children's genre-writing compositional scores were larger T+C-gen letter-counts, teachers feeling well prepared for handwriting tuition, and more recent teacher qualification. The same factors predicted longer word length and lower frequency.

12.2 Principal themes

Developmental theories of writing focus on working memory, the interplay between transcription, text generation and executive functions, and strategies adopted in order to reduce cognitive load. McCutchen (1996) and Berninger and Winn (2006) focussed on the limitation in the size of the working memory resource available for children; compositional quality is dependent on the availability of sufficient working memory resources to facilitate text generation and executive functions.

Lower-level skills are distinctive because they can be automatized through practice. Automatization releases resources for higher-level processing, enabling promotion of compositional quality. There is widely-accepted evidence that extent of automaticity of handwriting is associated with compositional quality throughout primary schooling. For instance, Graham et al. (1997) demonstrated that it predicted compositional quality and Medwell et al. (2009) found that children whose handwriting was slow are considerably less likely to achieve the compositional standards expected in Key Stage 2 SATs. Intervention studies, for example, Alves et al. (2016), have demonstrated that handwriting fluency improves after explicit teaching and both amount written increase and quality of composition improve. Similarly, Graham and Harris (2017) showed that interventions using explicit instruction on a range of writing skills result in comparatively large effects in compositional quality.

Bereiter and Scardamalia's (1987) model of skilled writing, knowledge transforming, incorporated initial analysis of a writing problem, goal setting, content and discourse problem spaces, and a reciprocal relationship between these in which the problem is interpreted. Bereiter and Scardamalia's developmental model of writing, knowledge telling, provided a strategy in which sentences just written, the topic area and writing genre stimulated retrieval of further information from the long term store of content knowledge. This cyclical process is repeated until all content knowledge has been utilized. McCutchen (2000) suggested that knowledge telling enables writing through managing working memory availability.

Despite extensive research, children's writing-skills remain below target, suggesting that further variables require investigation. This project has explored novel aspects of writing which might contribute to higher attainment in writing. Four key themes are explored below.

12.2.1 Provision: NC, school policies and teachers vs. models of motor learning

The NC in England has provided detailed guidance for the teaching of composition and spelling in Upper Key Stage 2 throughout the last 20 years. In contrast, there has been very little for handwriting tuition and the teachers participating in this project described such as there was as ‘vague and lacking in guidance’. There are a number of other sources of information available providing guidance on handwriting tuition. These include school policies, training (preservice and INSET) and academic studies providing research-based recommendations.

The NC for handwriting in operation at the time when data collection occurred specified that children were required to receive lessons until the end of Year 4 (8-9 years). However, the handwriting and motor development theories and research summarised in chapter 1 suggest that handwriting skills are unlikely to be well-developed by this age (Chartrel & Vinter, 2006; Palmis et al., 2017; Plamondon et al., 2013). The findings of Study 7 in the current project suggested that handwriting scores (as related to APP and SATs marking criteria) were associated with genre-writing scores amongst those whose composition attained higher marks. This suggests greater availability of working memory resources to devote to higher level writing processing amongst those with more well-developed handwriting skills. Unlike the NC, all of the policies of schools participating in this project specified that handwriting tuition should continue throughout primary school. Nonetheless, only school 3 indicated the level of provision recommended in Graham and Miller (1980), suggesting that a comparatively low level of priority was placed on handwriting tuition.

The teachers who participated in this project felt that there should be handwriting tuition throughout primary school with only one considering that it should stop before upper Key Stage 2. Despite this, whole-class handwriting tuition data was submitted for only three of the eight classes

and only one class timetabled the recommended amount of tuition. This mirrored the teacher surveys discussed in chapter 2 which indicated that teacher beliefs about tuition did not always marry up with classroom practice. A possible explanation is that primary school timetables are crowded and some of the participants explained that they were not able to incorporate as much handwriting tuition as they would have preferred.

Overall, the age-range for which there was a statutory requirement for handwriting tuition in the NC did not appear to be in keeping with models of motor learning described in chapter 1. The handwriting policies of the participating schools did specify that handwriting tuition should occur throughout primary school, but amount of time allotted did not meet the recommendation by Graham and Miller (1980) except in one school.

12.2.2 Teacher experience, beliefs and training

Two of the three strongest predictors of children's genre-writing scores were teacher-based and clearly evident in the teacher interviews. These were number of years since initial training and sense of preparedness for teaching handwriting.

Teachers' classroom practice is influenced by their practical experience and training, the NC, school policies, and childhood experiences (Graham & Harris, 2014; Miller & Shifflet, 2016; C. Stuart & Thurlow, 2000; Wilkins, 2011). There may, however, be conflict between national expectations, and professional values and teacher beliefs, including those developing at the time of initial training. There was a fifteen year range in the time since the participants had qualified and national expectations of teachers changed within this period. Five of the teachers participating in this project began their initial training before the introduction of the NC dating from 1999 whereas the remainder qualified more recently. Before 1999 individual teachers had considerable control over the content of children's curricula and used their professional beliefs and values in order to decide what was

appropriate for their particular class, rather than governmental specifications. Subsequently, performativity, which involves effectiveness of performance being judged through scoring systems, became prominent (see Ball, 2003). For example, schools are given grades by Ofsted, and SATs, while originally intended as a means of comparing schools, are also now used in order to rank children. In addition, a detailed statutory curriculum was adopted.

Five of the teachers began their training before the introduction of the 1999 curriculum and the remaining four afterwards. Individuals within each groups seemed to share various characteristics whereas there appeared to be between-group differences.

The teachers who had qualified earlier prioritized creativity rather than lower-level writing skills. They appeared much less likely to impose time-limits on writing tasks, partly due to teacher principles about compositional writing tuition. In most cases the concept of testing writing attainment conflicted with beliefs about effective writing tuition. These teachers tended to dislike the phenomenon of ‘policies’, whether at national or school levels. In particular, they appeared to feel disengaged from their own schools’ handwriting policies and tended not to be aware of school handwriting styles.

More recently qualified teachers appeared to adopt a markedly different position. Most valued handwriting accuracy and presentation and welcomed the greater emphasis on basic skills in the new NC. They felt personally engaged with the school writing style since they had contributed to its choice. As well as allotting a comparatively large amount of time to dedicated handwriting tuition, most of these teachers timetabled extended writing opportunities and monitored how much their children were writing. They also explicitly levelled writing, including in feedback to children in which there was guidance on next steps necessary in order to upgrade marks.

Children taught by teachers who felt that they had received adequate instruction in handwriting tuition tended to score higher in the genre-writing tasks. This might be a consequence of increasing emphasis being placed on handwriting, whether in initial training or INSET. There was no corresponding effect for training in promotion of handwriting speed. The sole teacher who actively attempted promotion of handwriting speed explained that she had received minimal training in speed promotion and expressed considerable doubt about her effectiveness in this respect.

Writing assessment scores in this project tended to reflect the teacher groupings previously described. Children in classes taught by teachers in the first group tended to have smaller mean letter-counts in T-gen and T+C-gen writing, wrote with less lexical richness and gained lower genre-writing scores. The highest performing classes were those in which extended writing opportunities with time-limits and dedicated handwriting tuition were timetabled, taught by teachers who felt well-prepared for handwriting tuition.

12.2.3 Handwriting skills and the promotion of compositional quality

Development of skills such as handwriting is dependent on practice and, following sufficient practice, the demand placed on working memory resources reduces. However, Graham and Harris (2017) simply recommended that children should write ‘more’ and the NC gives no recommendations about appropriate amounts of writing over a given period.

Since writing requires parallel processing of a range of complex skills there is a continuing risk of cognitive overload throughout primary education. Many of the teachers participating in this project discussed the effects of cognitive overload on compositional quality, spelling, and handwriting speed and neatness though just one explicitly described a mechanism for linkage between transcription skills and compositional quality. There was also an emphasis on the need for dedicated handwriting practice.

The majority of handwriting practice is likely to occur across the curriculum. The surveys reviewed in chapter 2 indicated a broad range of classroom writing durations per week. Similarly Study 3 demonstrated that there was considerable difference in the amount of writing carried out in the classes participating in this project. For instance, there was a 16-fold difference between numbers of letters written by the most and least productive children, and mean letter output in the four lowest productivity classes was less than half that in the three classes with highest letter-counts. Teachers in three classes timetabled extended writing activities at regular intervals. Not only does extended writing enable increase in amount of transcription skill practice, it offers opportunities for practicing higher-level processes in writing. Indeed Medwell et al. (2007) suggested that there may be a potential effect on compositional quality consequent on more successful practice and the resulting greater availability of working memory resources to devote to composing, as in Stanovich's (1986) concept of the 'Matthew effect' for reading.

Unlike the old NC, the new NC recommends dedicated handwriting practice until the end of primary education, in part to enable children to write with 'increasing fluency and speed'. Nonetheless, no advice is given for classroom activities designed in order to achieve this. Handwriting speed or time-efficiency was not mentioned in seven of the school handwriting policies. Only one teacher actively promoted speed in handwriting lessons, explaining that she felt responsible for preparing children for the pace of handwriting necessary for coping with the secondary school curriculum. There was also indirect promotion of handwriting speed in the second and third most productive classes with specification of the amount of writing expected in tasks and regular monitoring.

Almost all of the teachers felt that there was a stronger association between handwriting speed and compositional quality than between handwriting neatness and compositional quality. Medwell et al. (2009) showed that automatization (rather than speed though these variables were positively

correlated) was a stronger predictor of compositional quality for children aged 11 than handwriting neatness, as described in Key Stage 2 handwriting marking criteria. Nonetheless, despite their belief that handwriting speed was more associated with compositional quality than its neatness, the majority of teachers participating in the current project focused on accuracy of letter and join formation. For most of the teachers, 'good' handwriting appeared to be perceived as an accurate replication of the school's style. Such a replication is likely to depend on feedback control, a process which is not ultimately compatible with automatization which is characterised by feedforward control. Tucha, Tucha, and Lange (2008) found that there was a reduction in automatization (associated with speed) in the handwriting of children when they were asked to write neatly.

Graham and Hebert (2011) discussed the 'presentation effect' i.e. children whose handwriting is neater scoring higher marks. Many of the participating teachers did believe that neatness was important but it appeared this was because it reflected a positive attitude to learning rather than the presentation effect. Several teachers emphasised the importance of the self-confidence the children gained from writing neatly and their consequent motivation to produce more written work. One had even discussed with her class character-insights which could be derived from handwriting. It would appear likely that until children are personalising their handwriting by adhering less closely to the school's handwriting style. the question of deriving accurate character-insights from handwriting seems at best questionable particularly since there is a lack of empirical-evidence.

A variety of other causes of writing difficulties were suggested in the interviews in the current project, for example insufficient motivation. The Hayes-Flower model of writing (J. R. Hayes, 2012) includes motivation to initiate a writing task. There has been some research into the negative effects of untidy handwriting on self-esteem and motivation (e.g. Biotteau et al., 2019; Graham, Harris, et al., 2008). This may be exacerbated by feedback which focusses on transcription rather than compositional quality,

as discussed by two of the participants. The motivational benefit of attractive handwriting has not been explored in depth.

Overall, while recognizing that there are circumstances when neatness is a priority, understanding of the benefits of rapid handwriting and the consequences of over-emphasis on neatness is important in terms of children's academic achievement. The teacher responses outlined above suggest that opportunity for relevant INSET may enhance children's performance.

12.2.4 Writing environments and text generation

The analyses of text-generation differentiated by writing environment has shown that compositional quality of C-gen writing and its lexical richness were both significantly predicted by T+C-gen letter-count. In contrast, neither was by T-gen letter-count. These findings may be a product of the relative efficiency of processing of unfamiliar vocabulary in T-gen and T+C-gen writing.

The lexical quality hypothesis (Perfetti, 2007) indicates that storage of vocabulary in long-term memory occurs only after acquisition of detailed orthographic, phonological and semantic knowledge. While this deep processing is cognitively demanding the consequence is a store of stable word representations. It seems highly likely that in order to create meaningful text, children will use vocabulary previously stored in semantic long-term memory (Dobbs & Kearns, 2016).

Study 3 established that the great majority of teacher-generated writing was copied. Copying requires accurate recording of information derived from another source which may be remote (e.g. a class whiteboard). It demands skills in handwriting, spelling and accurate gaze-relocation when returning to the source material (Castles et al., 2007; Laishley et al., 2015). There may also be a requirement to cope with teacher-driven time-pressure. Processing meaning, while desirable, is not essential and neither orthographic and

phonological knowledge are critical in order to produce accurate copies. Indeed, working memory demands associated with transcription (especially for children) may result in sufficient cognitive load that comprehension of meaning is not prioritized or, perhaps, even possible. Conditions typical of copying would appear potentially prejudicial to deep processing of vocabulary. One possible ameliorating measure for occasions when copying is indispensable would be use of on-desk portable electronic devices, in order to reduce the size of gaze-shifts. In addition, some children's seats may not face the front of the class and additional screens at the sides of the rooms might facilitate copying.

Minimal research has been carried out into spelling errors when copying. Bonin et al. (2015) identified that almost all spelling errors in copying by adults were phonologically implausible. Similarly, Study 5 identified that there was a significantly higher proportion of phonologically implausible than plausible spelling errors in copied writing. In addition, Laishley et al. (2015) found that gaze shifts were often not at syllabic boundaries which does not reflect French findings of syllable effects in writing production (Kandel et al., 2011). Laishley et al. concluded that during copying of words of greater than four letters in length, there might be a tendency towards non-lexical rather than lexical processing. This might imply that the process of copying may not always promote formation of long-term semantic memories.

In T+C-gen writing, for example during explicit instruction, vocabulary is introduced by teachers and then used by children in self-generated sentences, with teacher scaffolding as necessary. Effective T+C-gen writing incorporates sufficient explanation to enable children's sentences to be meaningful. There is particular emphasis on managing working memory demands. The consequence may be more capacity for deep processing of new vocabulary during T+C-gen writing than in T-gen writing.

Study 4 showed that there was a positive association between lexical richness of C-gen writing and amount of T+C-gen letter-count. Study 6

probed this finding and identified that there were there were significant positive correlations between genre-writing scores and numbers of either word-types or topic-relevant word-types encountered in preparation for the genre-writing tasks. There were similar associations for numbers of word-types or topic-relevant word-types which were used in both preparation for the genre-writing tasks and the tasks themselves. Again this suggests that T+C-gen writing is a positive environment for vocabulary acquisition and/or developing executive function skills (Graham, McKeown, et al., 2012).

Adams et al. (2013), Chenoweth & Hayes (Chenoweth & Hayes, 2003) and Torrance and Galbraith (2006) indicated that creative writing involves an ‘inner voice’ whose output is phonological in nature. This offers the possibility of transcribing using the sequence of phonemes detected in the ‘inner voice’ if spellings are unfamiliar. Should this be the case, the spellings would appear likely be phonologically plausible. Study 5 showed that in child-generated writing (in which all vocabulary is familiar) spelling errors were more frequently phonologically plausible rather than implausible.

The findings of Studies 5 and 6 provide potential explanations for the results of Study 4. Copying may a comparatively inefficient tool for increasing vocabulary knowledge, in part because of the cognitive demands imposed. However, in lessons in which teachers introduce vocabulary which is initially used in a teacher-supported environment characterised by careful management of working memory demands, this may result in more effective vocabulary acquisition.

12.3 Implications

12.3.1 Theoretical implications

The role of copying in transcription

Copying necessitates both spelling and handwriting and is potentially cognitively demanding, particularly for children. It also involves visual

letter-position coding, initially to enable the reading of source material, and subsequently to enable accurate visual relocation on source material after within-word (or between word) gaze shifts. More frequent gaze-shifting by children when compared with adults is a product of children's comparatively lower working memory capacity (Castles et al., 2007; Laishley et al., 2015).

The not-so-simple view of writing (Berninger & Winn, 2006) incorporates transcription more explicitly than other models of writing and it is also emphasised in the capacity theory of writing (McCutchen, 1996). There is little consideration of the working memory demands deriving from transcription in other models of writing, although Kellogg et al. (2013) commented in their review of the model of working memory in writing (Kellogg, 1996) that it is likely to be significant for children.

Automaticity of handwriting or spelling skills does not imply automaticity of copying skills, since letter-position coding presents an additional cognitive demand. The findings of this project suggest that copying continuous text could be regarded as a secondary transcription skill, i.e. dependent on handwriting and spelling but also promoted by accurate letter-position coding.

Spelling novel/unfamiliar words in connected text

In the dual-route model of adult spelling (Coltheart et al., 2001) there is a bifurcation into lexical and non-lexical routes which function respectively via orthographic long-term memory or phoneme/grapheme correspondence (Rapp, Purcell, Hillis, Capasso, & Miceli, 2016). These processing options can be demonstrated in, for example, spelling to dictation, with a length effect on stimulus to writing latency associated with the non-lexical route (words with greater letter-counts requiring longer processing time) and a frequency effect associated with lexical route (faster processing of high frequency words).

There is evidence that adult and child spelling strategies differ in some respects although few studies have been carried out in this area. Bonin et al. (2015) incorporated written picture naming, spelling to dictation and copying in their study of writing by adults. Amongst their findings they identified a word length effect for copying, which they attributed to a requirement for sequential visual coding. Laishley et al. (2015) investigated word and frequency effects in immediate copying by children (mean age 9 years 1 month), using words which were either 4 or 8 letters long. Following gaze lift analysis, they concluded that there was a tendency for longer words to be processed non-lexically since 50% of gaze lifts did not coincide with syllable boundaries. These findings suggest that for longer words semantic processing may be comparatively effortful for adults and it would appear likely to be yet more problematic for children. Important in this context is the relative immaturity of letter-position coding for children of this age (Castles et al., 2007): if gaze shifts are required, relocation on the source material may be inaccurate.

An important functions of both T-gen and T+C-gen writing is introduction of novel/unfamiliar vocabulary. Study 5 identified firstly that in copied writing phonologically implausible errors were more frequent than plausible errors (as in Bonin et al., 2015), whereas in C-gen writing the majority of spelling errors were phonologically plausible. Secondly, as shown in Study 7, T-gen letter-count did not predict compositional quality or lexical richness of child-generated genre-writing whereas teacher + child-generated writing did. A possible explanation for these findings is that high levels of cognitive demand experienced when copying results in greater likelihood of phonologically implausible spelling errors, due partly to lack of knowledge of pronunciation or meaning of unfamiliar words. In turn, this vocabulary is less likely to have been internalized due to insufficient depth of processing, and is consequently not available for subsequent use.

Together these findings suggest a possible mechanism of the spectrum for 9-10 year-old children's word spellings during copying text under time

pressure; this proposal is shown in figure 18. Source text vocabulary ranged from words securely established in long-term orthographic working memory to words which may neither have been comprehended nor with meanings inferred from context. When the orthographic representation of a word is incomplete but the phonology and meaning are known, the entire visual sequence of letters can be retained if the word is short, the spelling is correct, and the stability of word representation improves with increased experience (Perfetti, 2007). If the orthographic representation of a long word is incomplete but gaze relocation is accurate, providing the pronunciation is known, knowledge of permitted phoneme/grapheme correspondences permits spellings which are phonologically plausible even if incorrect. This processing may not, however, result in greater stability of orthographic representation. If neither phonological nor orthographic representations are stable and meanings are inferred or unknown, phonologically implausible spelling errors become more likely. This may be exacerbated if the word is sufficiently long to necessitate gaze relocation, which is more likely to be inaccurate if the word is unknown or unfamiliar.

Overall, figure 18 implies that the process of copying may not result in improvement in the stability of the representation of relatively unfamiliar words. This suggests that acquisition of vocabulary knowledge may be comparatively limited, a possible explanation for the lack of positive association between copying experience and child-generated genre-writing score. In order to verify this representation further, studies in which receptive and/or expressive vocabulary were tested would be required. These might include testing knowledge of word meanings after copying resulted in phonologically plausible or implausible spelling errors, or the relative effectiveness of vocabulary acquisition following rapid vs. normal speed copying (using either real but low-frequency words or pseudo-words whose meaning was inferable from context).

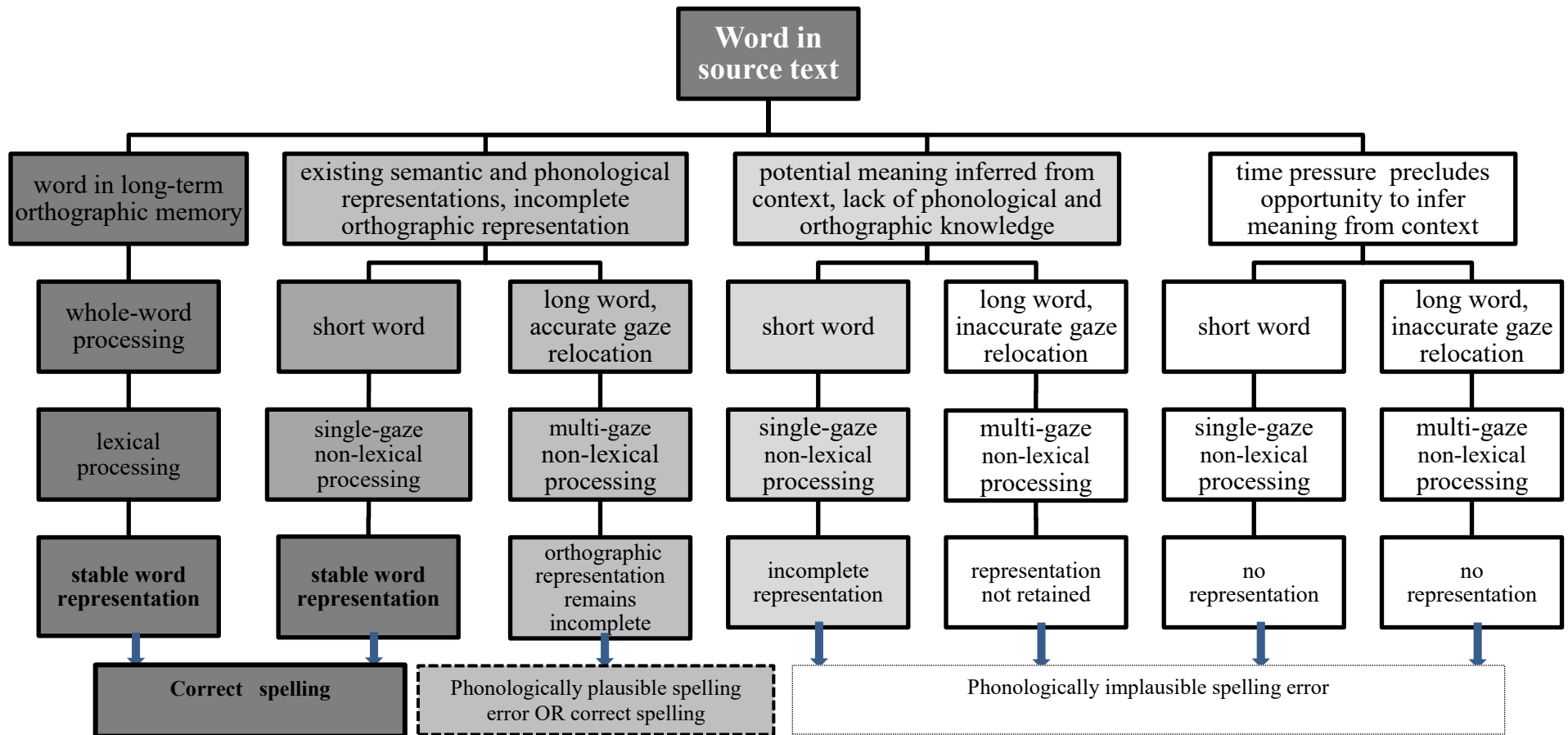


Figure 18 Provisional representation of factors predicting children's spelling accuracy during copying of text

12.3.2 Practical implications

Any wide-ranging practical implications of this research project are dependent on larger scale repetition or development of the studies in schools with different demographic intakes. Nonetheless some generalization to similar schools may be appropriate.

Copying

The participating teachers considered that little copying took place in their classes but photographic evidence demonstrated that this was not always the case. In particular, children in most classes copied lengthy lesson objectives. As described by Kidd (2014), this is time-consuming and there is no statutory requirement for children to write down lesson objectives. In one class, children were given pre-printed lesson-objective stickers. A practical implication of the current research is that schools should adopt this practice.

Cross-curriculum writing practice

This project showed that the inter-child and inter-class ranges in amount of cross-curriculum writing were very marked. It also demonstrated significant association between extent of cross-curriculum writing and the compositional quality of genre-based writing. A further finding was that only a minority of teachers indicated that children in their classes carried out regular extended writing tasks. Children in these classes also had the greatest overall letter-counts and achieved the highest genre-writing scores. Together, these findings suggest that greater prioritization of cross-curriculum writing practice in school policies would be beneficial, consistent with the findings of Graham and Harris (2017).

Drafting school handwriting policies

The consensus from the interviewees who participated in this research was that there was insufficient guidance in the NC for handwriting. Other sources of information are school policies and INSET. School handwriting policies are drafted independently and the level of detail provided in the

participating schools' policies varied considerably. INSET emphasising National Handwriting Association (NHA) guidelines (Tibertius, n.d.) would stimulate awareness of NHA recommendations and increase guidance for teachers.

Communication from writing researchers to educationalists

In order to raise writing attainment it is important that research-based teaching recommendations are implemented, but Graham, Harris, and Chambers (2016) concluded that communication between researchers and the education community was sometimes insufficient. School policy, interview and photographed data findings in this project demonstrated effective practice (e.g. explicit teaching of vocabulary, genre-characteristics and planning, peer-evaluation) also ineffectual tuition, for example practicing transcription skills using multiple copying and tracing. INSET specifically grounded in research-based recommendations would provide guidance.

Teacher training

The findings of the interview study suggested that additional training emphasising the cognitive foundations of the relationships between transcription and text generations would be beneficial. In particular, the prioritisation of handwriting accuracy and neatness by the participating teachers, despite their recognition that handwriting speed was more closely associated with compositional quality, suggested that their beliefs were not always congruent with classroom practice. INSET sessions developed from underlying theoretical frameworks of handwriting and writing would provide a means to broaden understanding.

12.4 Limitations

The novelty of the studies in this thesis resulted in both strengths and limitations. While ecological validity was high since all writing had taken place in a normal classroom context, lack of control of extraneous variables

reduced internal validity. For example, although the NC indicates that there should be instruction in particular writing genres or spelling strategies through a school year, the order in which this teaching takes place is determined by teachers and school policies. Possible consequences are that children's spelling knowledge is likely to vary between classes and some genres provide opportunities for use of more sophisticated vocabulary.

Although teachers selected the data collection weeks, with the proviso that they were 'typical', variability in amount of writing carried out between school weeks was not estimated. Reliability could have been estimated by splitting children at random within classes and performing letter-counts on different weeks' work, although this might have proved overly disruptive for teachers.

Since it was not feasible to photograph children's work in a large number of schools, it was decided that those recruited should be comparatively homogeneous in order to generate meaningful results. This necessitates considerable caution in terms of generalizability of results and, in addition, important effects associated with variation between schools may have been missed.

Key Stage 2 teacher interviews focussing on handwriting and writing tuition have not previously been reported in the literature. In consequence, interview questions could only be derived from theoretical literature and previous surveys. Although three pilot interviews were carried out, further refinement would have been profitable since vocabulary in some questions was interpreted differently by the study interviewees. For example, 'monitoring' and 'evaluation' were synonyms for some participants but the terms had different connotations for others. An initial focus group would have enabled additional fine-tuning of interview questions.

Although copying was mentioned in the teacher interview questions, and it and note-taking in the questionnaire, neither were framed in terms of writing environments and other forms of T+C-gen writing and C-gen were not

explicitly addressed. This was the case since the main focus of the interviews was handwriting instruction, which was relevant only to T-gen writing. Nonetheless, the entire spectrum of writing environments was commented upon in the interview responses; had there been questions specifically directed towards writing environments a more comprehensive picture could have been formed.

All letter counting was carried out by the same researcher, which promoted consistency, but reliability would have been strengthened if a random selection of the children's work had been examined by two raters. Letter-count accuracy depends on access to all writing carried out by children. Teachers were encouraged to provide all writing for photography but some exercise books may not have been submitted. Observation of a selection of lessons would have provided evidence of return rate. In addition, knowledge of individual children's absence from school, access to lesson plans and estimation of time dedicated to specific writing tasks for the data collection week would have been beneficial, but this data was not available.

Measuring spelling accuracy through correct/incorrect ratios is widely employed but not necessarily justified, and the lack of significant findings in Studies 3 and 4 may indicate that the measure was insufficiently sensitive to identify effects. A different technique for assessing spelling was used in Study 5, based on whether the spelling was a product of serial transcription of phonemes in the 'inner voice' or not. In addition, Study 7 assessed successful use of spelling strategies rather than categorizing spelling errors.

Accuracy of the allocation of items of writing into the T-gen writing environment was checked through tabulating all transcript content of each of the tasks completed by a given class and comparing between children. At the opposite extreme, C-gen word sequences were unique to individual children. T+C-gen writing constituted all writing which was not T-gen or C-gen and the validity of combining all of it into a single category remains to be established. It may also be necessary to carry out classroom observations to establish whether it is possible to distinguish accurately

between these forms of T+C-gen writing. If they are too heterogeneous to justify grouping them together, effects relating to one form of T+C-gen writing may be masked by opposing effects from others.

As indicated in Study 6, it was not possible to distinguish between class, genre, or preparation for genre writing effects. It was decided to include a random effect of genre in the MLM in Study 4, but this may instead represent a class or preparation effect and the identification of a genre effect should be regarded as at best tentative. Inclusion of more classes or a longer time period for data collection would have enabled separation of these effects. For example, if children had written several genre-writing tasks during the data collection period and the same set of genres had been undertaken in different classes, the relative size of class and genre effects could be investigated in a single analysis.

Most of the teachers who participated in the current project commented that the handwriting scoring in Key Stage 2 SATs lacked precision. In response the handwriting marking scheme was modified for Study 5 in order to increase its sensitivity through widening the range of scores from 3 to 5. Since this is a novel approach it is not possible to consider its validity and inter-rater reliability was not checked. However, the information derived from Assessing Pupil's Progress and the Key Stage 1 handwriting curriculum and other nationally published guidance is extensive along with examples of SATs writing assessments. For these reasons, it appears unlikely that using the scoring scheme used in this project was problematic.

Handwriting automaticity was not measured in this project. An opt-out participant recruitment policy was used, permitted since there was no direct contact between the children and the researcher. This precluded use of the alphabet test for orthographic-motor integration. Gaining ethical approval for an opt-in recruitment process would have enabled use of the alphabet test for orthographic-motor integration. This procedure would, however, have been likely to reduce the size of the participant pool markedly,

reducing the size of the data-base of photographed work. This issue is addressed in the following section: future research.

Vocabulary learning was also not assessed in the current project. Study 4 indicated that while amount of T+C-gen writing was significantly associated with lexical richness of C-gen writing, this was not the case for the amount of T-gen writing. This might be a consequence of the relative influence of writing-environments on the efficiency of vocabulary acquisition. As a result, Studies 5 and 6 were introduced in order to probe the Study 4 findings. Dobbs and Kearns (2016) commented that productive use of target novel vocabulary was a strong measure of effective learning. However, there was no measure of prior knowledge of newly introduced vocabulary in either their investigation or the current project. Vocabulary acquisition is considered in future research.

12.5 Future research

The schools in the current project were deliberately homogeneous. Follow-up studies involving demographically different schools would enable further investigation of variables shown to predict compositional quality in this project. Driven by research into signature recognition and palaeography, considerable advances are being made in software for recognition of cursive writing (see Jayashree, Geetha, Aadith, Kolla, & Jayasurya, 2018) and systems are likely to be available for large scale studies within a comparatively short time-frame.

Evidence from the teacher interview data suggested that teachers were aware of the effects of cognitive overload in writing but were not confident about appropriate prioritisation of handwriting speed vs. accuracy/neatness. Some felt that they would benefit from advice about promoting children's handwriting speed, a potential topic-area for INSET. Development of a questionnaire would help to investigate knowledge about handwriting as teaching careers progressed. Such a questionnaire could also be used to assess changes associated with interventions (initial training, INSET, or

personally initiated training) which aim to enhance the teaching of handwriting.

Graham et al. (1997) demonstrated that automaticity of handwriting is a strong predictor of compositional quality amongst upper primary school pupils. Automaticity of handwriting is a product of practice but it is not possible to measure total practice since individuals start to learn to handwrite. In this project, letter-count over a limited time period was measured. A future study investigating the relationship between handwriting automaticity and amount written (as in this project) would provide evidence indicating whether amount written provides an estimate of automaticity.

Very few studies have examined writing environments (Brindle et al., 2016; Coker et al., 2016; McHale & Cermak, 1992a). Establishing the extent to which copying occurs and identifying the proportion of children who are unable to copy sufficiently fast to record lesson content would enable exploration of the effectiveness of copying as a teaching technique. Apart from explicit instruction, little is known about the effectiveness of other forms of writing activity undertaken in a classroom context, whether T+C-gen or T-gen and especially for children, and how they compare. As discussed previously, combining the various forms of T+C-gen writing identified in this project (for example, explicit instruction and note-taking) into one writing environment remains to be justified.

The current project did not aim to investigate vocabulary acquisition directly. However, the findings suggested that a comparison between extent of vocabulary internalization in T-gen writing and T+C-gen writing would be informative. Experimental analysis of vocabulary learning following writing in different types of learning-environment (e.g. copying, explicit teaching, unassisted note-taking) would increase understanding of vocabulary knowledge acquisition. Such investigations might incorporate immediate and delayed testing of vocabulary and content knowledge, and

Key Stage 2 SATs attainment. In addition, comparison between efficiency of vocabulary acquisition in words in which either phonologically plausible or implausible spelling errors had been made would increase understanding of relative cognitive demands imposed by copied writing or writing in explicit teaching sessions.

A database of 4,700 word-types (61,000 word-tokens), including letter-by-letter records of all spelling errors, has been assembled in this project. It is the first which includes all handwritten work carried out at school (i.e. not merely compositional writing). The database will enable further investigation of children's spelling errors in normal school work, spelling list content, and more comprehensive error analysis. For example, the spellings lists learned by children at school may not reflect the words they actually use in writing and the database of spelling errors might have practical implications in terms of word selection for spelling lists. More detailed spelling error analysis, for example including morphemic errors, would facilitate investigation of the relationship between progress in spelling skill acquisition and genre-writing compositional quality, reflecting multiple route theories of spelling development, i.e. integration of multiple patterns theory (Treiman & Kessler, 2014) and triple word form theory, (Berninger et al., 2009).

12.6 Conclusion

The findings of this PhD project highlight a number of previously overlooked aspects of writing tuition, for example amount of writing taking place across the curriculum in different writing environments, and others which received comparatively little attention such as perceived adequacy of training for handwriting tuition by teachers. Development of research and educational policies in these areas has the potential to help teachers to enable more of their pupils to reach their full academic potential.

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Appendices

Appendix A: Letter to head teacher

University ethics committee number: 120623
Psychology Department,
Faculty of Health and Life Sciences,
Oxford Brookes University,
Headington Campus,
Oxford. OX3 0BP
Telephone 01865 483771

4th May, 2012

Principal Researcher:

Annabel Molyneaux, annabel.molyneaux-2011@brookes.ac.uk

Supervisors:

Dr Anna Barnett, 01865 483680, abarnett@brookes.ac.uk

Georgina Glenny, 01865 488570, goglenny@brookes.ac.uk

Handwriting practice and writing speed

(Research funded by Oxford Brookes University)

Dear Head Teacher,

I am contacting you to invite you to take part in a PhD project on handwriting practice and speed.

Handwriting is a basic yet crucial component of literacy and fluent handwriting is essential for the production of sufficient text in a limited time-span. There is very strong research evidence that the greatest influence on calibre of writing is writing speed; children who write slowly achieve less at school. Despite this, there have been few studies on the factors influencing handwriting speed and there are no clear governmental recommendations for the teaching of handwriting.

One factor influencing handwriting speed is practice. Practice is an important component of the development of motor skills such as handwriting. Surprisingly the amount of words typically written by children throughout the school curriculum has never previously been calculated, either for English or other languages. I aim to measure the amount of words written by Year 5 children during a normal school week, enabling comparisons across schools and classes. I hope that the results will inform teacher practice and training.

The research

There will be two phases in this project. Phase one will involve several entire classes of children and their teachers, subject to consent. Pupil-

participation can be on either in opt-in basis or on an opt-out basis, according to head teacher preference. A few children will be invited to be take part in phase two; additional information will be given to the relevant schools and parents, and opt-in consent sought at that stage.

Phase one of the research will involve four schools with similar catchment areas. There will be approximately 180 participants, all in Year 5. For each class, the research will cover one normal school week. All written work by each child will be photographed. In addition, the children will be asked to fill in a very short tick-box form about the amount of handwriting that they do which is not connected with school. Ideally these forms will be completed on the Friday afternoon of the week in which word-output is measured.

In phase one I would also like to gather data on teacher-practice, via short interviews with the teachers of the classes in which word-output is measured. The interviews will take place before the data-gathering week for each class. Additionally, I would need access to limited demographic information for the classes involved in the research, for example how many children use English as an additional language. It would also be useful to have a brief discussion about school handwriting policy.

There are no individual benefits from taking part. However, greater understanding of handwriting-skill practice and the factors which may influence writing speed would be beneficial, particularly for pupils with slow handwriting. In addition, the findings may contribute to developments in teacher training and curriculum planning.

For further information, including details of ethical procedures, please see the enclosed parental and teacher information sheets. I am qualified as a 1:1 specialist dyslexia teacher and I have fourteen years of experience working in schools. I have had a recent CRB check (July, 2011).

Thank you very much for taking the time to read this letter. If you would like to discuss the project further I would be delighted to meet you. Should you be interested in sharing in this research, I would be very grateful if you could write a letter of confirmation to me on headed school writing paper.

Yours sincerely,

Annabel Molyneaux, PhD Research Student

Enclosures: Parental information sheet
Teacher information sheet

Appendix B: Teacher information sheet

University ethics committee number: 120623

Psychology Department,
Faculty of Health and Life Sciences,
Oxford Brookes University,
Headington Campus,
Oxford. OX3 0BP

4th May, 2012

Principal Researcher:

Annabel Molyneaux, annabel.molyneaux-2011@brookes.ac.uk

Supervisors:

Dr Anna Barnett, 01865 483680, abarnett@brookes.ac.uk

Georgina Glenny, 01865 488570, goglenny@brookes.ac.uk

Handwriting practice and writing speed

(Research funded by Oxford Brookes University)

You are being invited to take part in this research study which is being carried out at your school. Please read the following information carefully before you decide whether or not you would like to be a participant.

What is the purpose of the study? My aim is to research how much practice Year 5 children have at handwriting. This will cover all writing opportunities within the entire school curriculum. As part of the study, I am investigating teacher practice and viewpoints about writing and handwriting. I hope that this project will increase understanding of writing and help teachers to help children. Having enough practice and being able to write quickly are important because they are both associated with higher marks at school. The entire research project will run for three years.

Why have I been invited to participate? You are being asked to take part because you teach a Year 5 class at school. The head teacher has given consent for Year 5 children and their teachers to participate in the study, and every pupil in your class will be given the opportunity to take part. Children from other schools will also be involved and there will be a total of approximately 180 participants.

Do I have to take part? Even though the head teacher has given consent, it is still up to you to choose yourself whether you would like to be involved. If you decide that you would like to participate, please sign the enclosed consent form to say that you have read this information sheet and that you are happy to proceed. You will still be free to withdraw yourself from the project at any stage without giving any reason.

What will happen to me if I take part? I will conduct a brief interview with you about your classroom practices for handwriting and writing. The

interview will last for about thirty minutes and will be audio-recorded. In addition, during one typical school week I shall photograph all of the writing which has been done by the pupils in your class whose parents have given permission for their children to take part. This will include homework. There will not be any extra writing for the children to do because of the study. The photographed writing will not be assessed in any way, apart from counting the number of words and letters written. I will do the photography at a time convenient for you.

The only direct involvement for the children will be estimating the amount of writing that they do which is not connected with school. There will be a series of options (for example, 1-5 minutes each day) and the children will tick the appropriate box. Although all class members will complete tick-box forms, forms from children who are not taking part in the research will not be scrutinized and will be destroyed as soon as possible. I would be grateful if filling in this short tick-box form could take place in class, ideally at the end of the week when I have been photographing work.

What are the benefits and risks of taking part? Whilst there are no individual benefits from taking part, greater understanding of writing skills would be helpful, particularly for children who have difficulty with writing. There should be no risks, either for you or your pupils. Your commitments will be limited to the brief interview, allowing time for the children to tick boxes on the form recording writing and other forms of communication, and letting me know when it will be convenient for the photographing of pupils' writing to take place.

Will my interview responses be confidential? All of the information in my investigation will be treated in strict confidence while it is being collected and analysed (subject to legal limitations). Data will be stored electronically with access via a password. Schools will not be named. Teacher identity will be protected by use of pseudonyms, but there is a risk of individual identification with a sample of only approximately eight teachers. In consequence, permission to use quotations will be sought, and individual teacher pseudonyms will not be associated with specific schools. Children will only be identifiable by number and the content of photographed writing will be confidential.

What should I do if I would like to take part? If you would like to take part in this research, please sign and date the enclosed consent form, having initialled the boxes by each question. Then return it to me in the enclosed stamped and addressed envelope.

What will happen to the results of the research study? The results of this study will be published as part of a PhD thesis. All the data will be stored in keeping with the University's policy of Academic Integrity. This means that it will be securely stored in paper or electronic form for a period of 10 years after the project is finished.

Has the study been given ethical approval? This study has been approved by Oxford Brookes University's Research Ethics Committee. If you have any concerns about the way in which the study has been conducted, you should contact the Chair of the Oxford Brookes University Research Ethics Committee on ethics@brookes.ac.uk

Whom can I contact if I have any questions? Please ask the main researcher, Annabel Molyneaux, if you have any questions or you want further information about this study. My contact details are at the top of the first page.

Thank you very much for taking the time to read this information sheet.
Annabel Molyneaux, PhD Research Student

Appendix C: Teacher consent form

University ethics committee number: 120623

Full title of Project: Handwriting practice and writing speed

Name, position and contact address of Researcher:

Annabel Molyneaux,
Department of Psychology,
Faculty of Health and Life Sciences,
Oxford Brookes University,
Headington Campus,
Oxford .OX3 0BP
annabel.molyneaux-2011@brookes.ac.uk

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.
3. I agree to my interview being audio-recorded.
4. I agree to the use of anonymised quotations from the interview in the researcher's thesis.
5. I agree to take part in the study.

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

Appendix D: Teacher interview schedule

PART A

I am interested in handwriting in primary schools. In the first phase of my research I am looking at the handwriting which typically takes place in classrooms. It would be very helpful if you could share some of your experience as a teacher with me. As we go through the interview, a few questions will be easier for you to answer by ticking boxes; I will give you the questionnaire form when we need it.

1. For how long have you been a class teacher?
2. How many years have you taught in this school?
3. What do you think is important in the teaching of children's handwriting?
4. Which school years have you taught?
IF MORE THAN ONE:
 - a) Has the experience of working with children of different ages affected your teaching of handwriting?
5. Has there been much change in handwriting teaching over the course of your career?
6. Are there any changes in emphasis in handwriting teaching which you think would be helpful?

PART B TEACHER TRAINING

[Complete section A of questionnaire]

HANDWRITING POLICY

7. Does your school have a school handwriting policy?
IF YES:
 - a) How does the school handwriting policy affect your teaching?
 - b) Is handwriting speed specifically mentioned in the handwriting policy?
IF NO:
 - c) Do you think that having a school handwriting policy would be beneficial?
8. To what extent are older children in the school allowed to personalise their handwriting?
IF YES:
 - a) What do you think about this?

[Complete section B of questionnaire]

HANDWRITING LESSONS AND PRACTICE SESSIONS

9. Do you include specific handwriting lessons in your timetable?
IF YES:
 - a) How often do you have handwriting lessons?
 - b) How long are your handwriting lessons?
10. Do you have specific times for your children to practice handwriting which are separate from handwriting lessons? IF YES:

- a) How often do handwriting practice sessions occur?
- b) How long are the handwriting practice sessions?
- 11. Do you specifically promote handwriting speed?
IF YES:
 - a) How do you do this?
Probes only if necessary:
 - a) Writing frequently
 - b) Copying exercises
 - c) Doing timed writing exercises
 - d) Writing from memory
- 12. How much do your children write on pupil whiteboards in school?
[Complete section C of questionnaire]

THE RELATIVE IMPORTANCES OF HANDWRITING NEATNESS AND SPEED

- 13. To what extent is handwriting neatness related to quality of content?
- 14. To what extent is handwriting speed related to quality of content, assuming that the handwriting is legible?
- 15. Do you think that handwriting speed is more or less important than tidiness of writing?

HANDWRITING EVALUATION

- 16. How do you evaluate handwriting?
Probes only if necessary
 - a) Norm-referenced tests
 - b) Speed
- 17. How do you monitor handwriting?
Probes only if necessary
 - a) Frequency of monitoring
 - b) Use of a check-list

IF YES:

What is on the checklist?

[Complete section D of questionnaire]

HANDWRITING FEEDBACK

- 18. What kinds of feedback do children receive?
Probes as necessary
 - a) Goal setting
 - b) Corrective feedback
 - c) Compliments
- 19. Do you ask children to self-evaluate their handwriting IF YES:
 - a) What form does this take?

OTHER COMMENTS

Are there any other comments you would like to make about handwriting?

Thank you for taking part in this interview and enabling me to collect writing samples from your class.

Appendix E: Parent information sheet

University ethics committee number: 120623

Psychology Department,
Faculty of Health and Life Sciences,
Oxford Brookes University,
Headington Campus,
Oxford. OX3 0BP

4th May, 2012

Principal Researcher:

Annabel Molyneaux, annabel.molyneaux-2011@brookes.ac.uk

Supervisors:

Dr Anna Barnett, 01865 483680, abarnett@brookes.ac.uk

Georgina Glenny, 01865 488570, goglenny@brookes.ac.uk

Project funded by Oxford Brookes University

Handwriting practice and writing speed

Your child is being invited to take part in this research study at school.

Please read the following information carefully before you decide whether or not you would like him/her to be involved.

What is the purpose of the study? My aim is to find out how much practice Year 5 children have at handwriting. Having enough practice and being able to write quickly are important because they are both linked with higher marks at school. I hope that this project will increase understanding of writing and help teachers to help children. The research project will run for three years.

Why has my child been invited to take part? Your child's head teacher has given consent for Year 5 children to take part in this study. Every pupil in your child's class will have the opportunity to be included. Children from other schools will also be taking part; in total there will be about 180 pupils involved.

Does my child have to take part? Even though the head teacher has given consent, it is still up to you to choose yourself whether your child should be involved. If you are happy for your child to take part, no further action is needed from you. However, even when the research has started, you will be free to withdraw your child at any stage without giving any reason. If you prefer your child not to take part, please inform your child's class teacher within one week. School marks will not be affected by your decision about whether your child takes part in the study.

What will happen to my child if he/she takes part? If you decide that your child can take part, I shall photograph all of the writing that he/she does at school during a normal school week, including homework. There will not be any extra writing to do because of the study. The photographed

writing will not be marked in any way, apart from counting the number of words and letters written.

At the end of the research week, your child will fill in a short tick-box form showing how much handwriting he/she does each day which is not connected with school, for example, “None at all” or “less than 5 minutes each day”. Although all class members will complete tick-box forms, forms from children who are not taking part in the research will not be looked at and will be destroyed as soon as possible.

What are the benefits and risks of taking part? Your child will not benefit individually from this study. However, greater understanding of handwriting practice and what might influence speed of writing should enable children to do even better at school. The results may also help teachers with lesson planning. There should be no risks for your child. The only time taken will be ticking a box on the form recording handwriting.

Will what your child writes in this study be kept confidential? All of the information in my research will be confidential (subject to legal limitations). Each child will be given a number; names will not be used. Photographs of writing and records of writing not connected with school will be stored electronically using a password. I will not tell anyone how much your child wrote or what the writing was about. To help me to analyse the data, the head teacher will pass on some information about each of the children taking part, although your child’s personal details will not be identifiable in the analysis and written report since names will not be used. The information will include age, gender, any learning difficulty diagnosis, free school meals status and use of English as an additional language.

What will happen to the results of the research study? The results of this study will be published as part of a PhD thesis. All the data collected from this research will be stored in keeping with the University’s policy of Academic Integrity. This means that it will be securely stored in paper or electronic form for a period of 10 years after the project is finished.

Has the study been given ethical approval? This study has been approved by Oxford Brookes University’s Research Ethics Committee. If you have any concerns about the way in which the study has been conducted, you should contact the Chair of the Oxford Brookes University Research Ethics Committee on: ethics@brookes.ac.uk

Who can I contact if I have any questions? Please ask the main researcher, Annabel Molyneaux, if you have any questions or you want further information about this study. My contact details are at the top of the first page.

Thank you very much for taking the time to read this information sheet.
Annabel Molyneaux, PhD Research Student

Appendix F: Parent consent form

University ethics committee number: 120623

Full title of Project: Handwriting practice and writing speed

Name, position and contact address of Researcher:

Annabel Molyneaux,
Department of Psychology,
Faculty of Health and Life Sciences,
Oxford Brookes University,
Headington Campus,
Oxford .OX3 0BP
annabel.molyneaux-2011@brookes.ac.uk

- | | |
|---|--------------------------|
| | Please
initial box |
| 1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2. I understand that my child's participation is voluntary and that they are free to withdraw at any time, without giving reason. | <input type="checkbox"/> |
| 3. I agree to my child taking part in the study. | <input type="checkbox"/> |

Name of Parent	Date	Signature
----------------	------	-----------

Name of Child	Date of birth M/F	School and class
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Name of Researcher	Date	Signature
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Appendix G: Teacher questionnaire

NAME

DATE

SCHOOL

CLASS NAME

Please answer each question by ticking one box

Section A) Teacher training		Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree
1	I feel that I have received sufficient training in teaching handwriting.					
2	I feel that I have received sufficient training in promoting handwriting speed.					

Section B) Year 5 handwriting		Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree
3	Most children use joined-up handwriting for the majority of their work when they start Year 5.					
4	I expect my pupils to use joined-up handwriting for the majority of their work by the end of Year 5.					

Section C) Influences on handwriting speed		Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree
5	Completely joined-up handwriting is faster than writing which is not joined.					
6	Partially joined-up handwriting is faster than writing which is not joined.					
7	Most children who are eligible for free school meals handwrite fast enough to					

	cope in class.					
8	Most of the children in my class whose first language is not English handwrite English fast enough to cope in class.					
9	Most children on School Action handwrite fast enough to cope in class.					
10	Most children on School Action Plus handwrite fast enough to cope in class.					
11	Most children who are statemented handwrite fast enough to cope in class.					
12	The handwriting speed of individual children influences how I teach the class as a whole.					

Section D) When you evaluate or monitor writing, approximately what percentage of your class has difficulties in each of the areas listed below?		10% or less	11% - 30%	31% - 50%	51% or more
10	Getting behind when copying or taking notes				
11	Writing answers which are too short				
12	Untidy handwriting				
13	Poor quality of writing content				