FROM INVENTION TO CONVENTION: A LONGITUDINAL STUDY OF CHILDREN'S SPELLING DEVELOPMENT FROM 5-7 YEARS OF AGE

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CONTENTS

4

ABSTRACT

This longitudinal study investigated the development of conventional spelling in children's writing and was set within the theoretical context of constructivism. It was hypothesised that teaching approach, gender and cohort might influence this development, and that children would improve as writers and spellers over time.

The study had a naturalistic element in that children's unaided writing was obtained termly and was analysed using the Child Language Data Exchange System (MacWhinney, 1991). and an experimental element involving an annual spelling test. Children's understanding of the message concept was also considered.

There were several major findings of the study:

♦ The similarities between children were noteworthy. Regardless of sex and cohort, children select a similar range of words to use, and tend to spell the same words correctly.

♦ The range of words written by children was found to be wide; in both the naturalistic and the experimental aspects of the research.

♦ The writer's familiarity with the tale might have an effect on the quality of a narrative re-writing.

♦ An analysis of the word **was**, which was the word spelt incorrectly most frequently, showed no support for the theories of stages of spelling development put forward by the Virginia School (eg Gentry, 1991).

♦ Regular words in the spelling test were written more successfully than the irregular words.

♦ No significant difference was found between the spelling performance of boys and girls.

♦ Children improved their writing ability by occasion in relation to the number of words used, the number of different words used, and the degree to which these words were spelt conventionally. A particular spurt in development was noticeable between May/June in Year 1 and October/November in Year 2, for which no straightforward explanation can be made. This period of time appears to be significant in children's writing development and merits further study.

♦ The approach to the teaching of writing and spelling professed by schools had an effect on children's spelling development in relation to only one variable, the number of different correct spellings. In relation to the other variables, approach was found to have no significant effect.

10

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CHAPTER 1: STATEMENT OF THE PROBLEM

In order to learn to spell correctly in English, each individual must internalise a successful model of our orthography. Research has, to date, failed to offer a full explanation of how this occurs. Many children, despite the accurate and inaccurate information about the orthography which is conveyed to them through school and society, do learn to spell correctly. Others develop only a rudimentary understanding of the conventional system and experience life-long difficulty in producing accurate spelling. Despite the importance which correct spelling is accorded within our society, we are still unable to achieve success in teaching all children to spell conventionally.

This longitudinal study into the teaching and learning of spelling in the early years of formal education is premised upon the belief that children are highly organised and efficient learners. The theoretical basis of this research is constructivism, with written language acquisition seen as a dynamic and challenging cognitive process during which "children are theory builders and hypothesis testers" (Ruddell and Ruddell, 1994, p.83). Children initially apply these theories and hypotheses to spoken language, with the development of writing and then of conventional spelling as later acquisitions in children's drive towards communicating meaningfully within society. In relation to writing and the subskill of spelling, such theories and hypotheses will encompass symbolic and semantic representation and the communicative aspect of print.

This study is also based upon the belief that spelling is a cognitive process (e.g. Flower & Hayes, 1994). The role of the mental lexicon is seen as central to the writing and spelling process, (Ehri, 1994), and this theory as that most likely to explain the development of conventional spelling.

Underpinning this work is an acknowledgement that pedagogy derives, in part, from the view held by schools as institutions, and by teachers as individuals, of the nature of pupils' learning and its relationship with teaching methods. A teacher's philosophy of education, whether implicit

14

or explicit, will directly influence the teaching and learning approaches within the classroom. This is true of pedagogy in general and of the approaches adopted to the teaching of writing in particular, and this study aims to offer further insights into how classroom practice might best support the teaching and learning of spelling.

This research aims to examine the development of conventional accuracy in spelling during the first three years of compulsory schooling via a longitudinal study based on pupils attending six schools. This study will build upon recent research as it examines how and when conventional spelling develops in a sample of children. Theoretically derived hypotheses will test the relationships between the development of children's spelling ability and schools' perceived approach to the teaching of writing, and to gender and age. It is intended that the results of this study will contribute to the current and ongoing debate about the efficacy of teaching approaches, and add to general understanding of the development of quantitative and qualitative aspects of spelling ability.

CHAPTER 2: INTRODUCTION

2.1 Introduction

The need and desire to communicate drives the normal human child to understand and then acquire speech, and this move from the receptive to the expressive mode within spoken language is usually later mirrored by the development of reading and then writing. Spelling is one of the skills which contributes to the effectiveness of written communication, so the focus of this study is on one minor aspect of language development.

There are 500,000 words in the English language, although most of us use only about 25-50,000 of these. The question of how we learn to spell words is of central importance to this study. Is each word memorised or learned individually, or do we learn rules and then apply these? Is spelling a process of abstraction of principles or a process of acquiring habits? Does each individual learn in the same way?

The answers to such questions are of theoretical and practical importance given that instructional methods are closely allied to beliefs about learning and memory. The idea that spelling was learned by rote memorisation has had an effect upon the teaching and learning of spelling which still endures today. In more recent years, research into early writing development has had a direct influence upon some classroom practitioners, and this study will consider the relationship between teachers' perceived methods of instruction and the development of children's spelling.

The question of how beginning writers move from an inability to represent speech in visual form to an accurate and successful representation of such is the main focus of this work. Some children learn to spell with little evident effort, often with little or no direct instruction from parents or teachers, others eventually develop the skill but at a much slower and more laboured pace, and yet another category of children never become skilled spellers. The reasons for this are still unclear. Spelling is highly valued in society and within education, and many teachers put a great deal of effort into "teaching" spelling, and into correcting children's spelling errors, yet the wide range of differences between individuals

16

continues to exist. Might the key to these differences relate to the learning or to the teaching, or both? These inter-individual differences, and the relative failure of the education system to develop all children's ability to spell conventionally, have prompted this study. If we can plot how, when, and why children learn to spell, and consider whether particular educational approaches offer increased chances of success, then perhaps this can advance theory and inform current practice.

Spelling is one aspect of the writing process, and it is important that its development is considered alongside other aspects of writing.

> "The writing system is the whole, of which the spelling system and the script are parts"
> (Mountford, 1998, p.195).

The literature review will therefore address those aspects of writing and spelling English which it is felt are of central importance to this study. Young children learning to write English share some challenges which are common to all developing writers the world over, but also some which are particular to the English language itself. Many of these aspects of writing development are closely inter-related, but will be considered separately for the purposes of this study.

What, then, does becoming a writer involve? It is now generally accepted that writing is far more than a mechanical behaviour, as this quotation from Crystal indicates.

> "the process of writing: it is not merely a mechanical task, a simple matter of putting speech down on paper. It is an exploration in the use of the graphic potential of a language - a creative process, an act of discovery"
> (Crystal, 1987, p.212).

Birnbaum and Emig (1983) describe writing as a process " .. of immense perceptual, experiential, linguistic, and cognitive complexity" (p.92), and this very complexity makes it difficult to study. What appears to the observer to be a single skill is in fact the orchestration of many.

17

> "Writing involves a range of psychological processes and educational practices. It is obviously an integrative activity involving many complex procedures working in parallel, the age and experience of the writer affecting the degree to which these integrative processes operate"
> (Martlew, 1983, p.xiii).

For young and inexperienced children who are learning to write, these complex procedures are not compartmentalised and learned separately. Rather, like an adult learning to drive a car, the various aspects of learning to write may operate in parallel, and have to be orchestrated by the child according to his/her level of experience and expertise. Because of this, spelling does not start as a subskill of writing, but develops in parallel with other subskills such as letter formation in the early stages of children's development. Similarly, many of the other 'psychological processes and educational practices' referred to by Martlew impinge on writing and spelling development, and these will be considered in detail in Chapter 3.

2.2 Writing: an overview

Human beings have been speaking for approximately a million years but have been writing for only about five and a half thousand (Stubbs, 1980). Writing is therefore a relatively recent activity in human terms. Further, during those five and a half thousand years only a small number of the population has been able to read and write, and mass literacy in Britain did not become an aim until the introduction of compulsory education in the late nineteenth century. One hundred years later, more than 40% of the world's adult population could not read or write at all (Stubbs, 1980), and even within highly literate societies the number of writers is comparatively small compared to the number of readers (Kress, 1994).

Writing, then, is a learned skill which performs a vital function in the modern, industrialised world where print is all-pervasive, but which is not a natural or universal human activity.

> "In the ontogenesis of the child, writing comes after speech. A conventional, codified activity, writing is an acquired accomplishment. It is not a gift. It is within

our reach once a certain level of intellectual, motor and affective development has been attained. It is language and movement, but is restricted by the context in which it takes place, by its rigorous graphic figuration, and the rules of spelling governing transcription of the language"
(de Ajuriaguerra & Auzias, 1980. p.68).

The increasing importance of literacy during the last century, together with the expansion of compulsory education, has increased our need to understand how humans learn to read and write, and indeed how learning in general is best achieved. Reading received the earliest attention from educationalists and researchers, and the study of writing development has received significant attention only within the last three decades. The study of spelling has been subject to even less attention, and was neglected until the 1980s (Pattison and Collier, 1992). There is an acknowledged need for further exploration and research in this important area of literacy.

2.3 Speech and writing

Oral language is the first mode of language to develop, and, according to Pinker (1994), is the product of a biological instinct.

"Language is a complex, specialized skill, which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, is qualitatively the same in every individual, and is distinct from more general abilities to process information or behave intelligently"
(Pinker, 1994, p.18).

This propensity drives children to acquire spoken language in their desire to communicate with those around them, and the process of this acquisition is one of constructivism, with children gradually discovering the vocabulary and grammar underlying the language of their community whilst concentrating on meaning (Barnes, 1992). Chomsky pointed out two fundamental facts about language. The first was that virtually every sentence uttered is a new combination of words, perhaps appearing for the first time in human history, therefore language cannot be a learned

19

response; the brain must contain the facility to build an unlimited set of sentences out of a finite list of words (i.e. a mental grammar). The second was that children develop this grammar quickly and without formal instruction. They are able to give consistent interpretation of sentence construction they have not heard before, so they must have an innate capacity for language and grammars, a Universal Grammar, that helps them to devise the syntactic patterns from the speech of their parents and carers.

Is learning to write and spell as "natural" as learning to speak? According to Vygostsky (1962), two stages of knowledge acquisition have been distinguished. The first involves a concept evolving spontaneously and unconsciously, and in the second stage this slowly becomes conscious. As print is the representation of spoken language, reading and, by definition, writing, are more difficult than speaking, and involve the second stage.

Liberman and Liberman (1990) perceive a similar distinction.

> "Surely it is plain that speech is primary in a way that reading and writing are not. Accordingly, we suppose that learning to speak is, by the very nature of the underlying process, much like learning to walk or to perceive visual depth and distance, while learning to read and write is more like learning to do arithmetic or play checkers"
> (Liberman and Liberman, 1990, p.55).

For Perfetti (1995) it is the man-madeness or the artificiality of writing which is the essential difference between learning to talk and learning to write. The writing system which the child has to learn is related to cultural and national traditions, and each language brings its own challenges.

> "Writing systems differ just as languages do. However, while the child seem to implicitly (and biologically) know the principles of language design prior to acquiring spoken language (Pinker 1984) there appears to be no parallel case to make for writing systems... The design of (spoken) languages may be universal, the design of writing systems appears not to be"
> (Perfetti, 1995, p.110).

Thus written language is a human invention, and the child's task in becoming literate is to work out how the relevant system works to encode his/her language. Writing is generally accepted as "an optional accessory" (Pinker, 1994, p.16) to the more natural spoken language. It would appear that the similarities in children's acquisition of speaking and writing relate to the approach to learning which they require. It is now accepted that children do not acquire language by rote or imitation alone, but that they need to construct for themselves the concepts and understanding necessary to acquire oracy and literacy. Children are active learners who build and test hypotheses about language. Just as in learning to speak, the child learning to read or write will be forming views and testing these.

> "Children seek constantly to make sense of their world through hypothesis generation and testing, and they make sense of the language system in much the same way; throughout the process of language development they change or adjust current hypotheses to reflect new knowledge"
> (Ruddell and Ruddell, 1994, p.84).

The writer holds that children learning to write and spell must, at some point in their learning, form their own hypotheses about print, although the type of instruction received may influence when this occurs. Not all advocates of constructivism accept its relevance to spelling.

> "The constructivist approach is not appropriate to all school learning. Some knowledge, if it is of the factual kind, or defined by convention, may need to be transmitted directly; for in such cases, creativity or personal imagination are not required, and any alteration would not be beneficial. Examples might include learning the alphabet, spelling, the rules of punctuation;..."
> (Selley, 1999, p.5).

This view of spelling and punctuation appears to reflect a limited understanding of literacy, and shows the extent to which the teaching of

21

spelling is still seen as requiring transmission and rote learning by some experienced educationalists.

Mattingly (1984) believes that the primary linguistic features of speaking and listening are natural in all human beings, but that secondary linguistic activities, such as writing, require linguistic awareness, or knowledge of the grammatical structure of sentences. Mattingly concludes that children who continue to acquire language "beyond what is required for performance" (1984, p.25) are likely to learn to read (and write) more easily. Stuart (1995) notes a similar relationship.

> "The children who easily learn to read are the children who have earlier become aware of the spoken forms of words, who can focus on the window of speech as well as look through it to meaning"
> (Stuart, 1995, p.126).

Although the links between reading and writing are strong, there is evidence, too, of key differences. In a seminal book, Gibson and Levin (1975) point to one of these.

> "The difference between reading and spelling is analogous to that between recognition and recall, acknowledged by psychologists to be different processes. Recognition is the easier process, in that it requires less information to be able to distinguish and identify a display produced for one than to produce it oneself. A word can be recognised correctly without full information about its sp-ll-ng"
> (Gibson & Levin, 1975, p.335).

Nelson (1980), too, notes this difference, and also points to the fact that the number of phoneme/grapheme relationships is different for reading and spelling. In reading, the number of phonemic alternatives for any one grapheme is generally fewer than the number of grapheme alternatives for any one phoneme when writing, helping to explain why recognition is easier than recall when relying on sound/symbol relationships.

22

Although there are clear differences between spelling and reading, studies have found high correlations between spelling performance and word recognition and oral reading (Zutell, 1992). There are also obvious links between reading and writing which are important to this study. Much of the research into reading development has been central to the development of spelling theory, and where appropriate this will be explored.

2.4 Writing systems

Complications arise for researchers because the various language systems of the world operate in distinctive ways, and the written form of each language places different demands on writers in terms of organisation and written representation. Modern languages can be broadly divided into phonological and non-phonological systems, where phonological systems show a clear relationship between the symbols and sounds of the system, whereas non-phonological systems do not. In phonographic systems, symbols are used to represent words or parts of words. Symbols are paired with arbitrarily assigned sounds and names.

Languages vary greatly both in their graphemic/phonemic regularity and in the number of symbols within their alphabets (Crystal, 1987, 1995). In those languages which have a consistent relationship between symbol and sound the writer faces a relatively straightforward task. If a writer is able to segment speech into its constituent language units and has knowledge of the sound/symbol relationship, this should be sufficient for correct spelling. In such a regular system, writing can be considered as the direct encoding of speech.

English, however, is a complex alphabetical system, with 26 letters in its alphabet and 44 phonemes which these represent (Perera, 1984). The relationship between sound and symbol cannot, therefore, be systematically regular. This lack of a direct one-to-one correspondence between phoneme and grapheme makes the English writing system an irregular alphabetic writing system. This originally arose because the spoken language, Anglo-Saxon, was written as phonetically as possible using the Latin alphabet which could not represent four of the sounds needed. Writing started as the straightforward encoding of speech, but the

23

writing system has not kept pace with pronunciation changes and, with the advent of dictionaries and printing, there was a standardisation of spelling which moved away from representing regional pronunciation differences. Together with influences of Latin and Greek and various other languages over the years, we now have a system which requires lexical and morphemic knowledge as well as graphemic/phonemic knowledge, as speech encodes higher order features such as homophonic distinctions, lexical identities and morphology. This standardisation of spelling is noted by Carney (1994).

> "The spelling of English word is now relatively fixed in a traditional orthography, even though there is no official `Academy' in any English-speaking country vested with authority to decide what the `correct' spelling of a word should be. We turn to the dictionaries printed by respected publishers to find how a particular word `should be' spelt" (Carney, 1994, p.66).

Thus, in morpho-phonemic scripts such as English, sound-symbol knowledge plus segmentation ability is not sufficient for accurate spelling to develop. The successful writer needs to have knowledge of lexical items, plus some morphemic awareness and understanding of the orthographic conventions of English. This, then, is the linguistic context within which this study is set.

CHAPTER 3:   BACKGROUND TO THE STUDY

3.1 Introduction

A skilled writer manipulates the various aspects of the writing process so adeptly that the complexity of the total process is not obvious to an observer. Each instance of written language use is thus "an orchestration of a complex social event" (Harste, Woodward & Burke, 1991, p.61). To separate these aspects for discussion is necessary for clarification, but it must be remembered that these elements, particularly spelling, do not occur in isolation. Written language is not an independent activity but is also subject to the demands of the situation "like a kaleidoscope, its parts are ever newly arranged, newly revealing" (Dyson, 1985, p.59). Dyson also notes that young children learning to write do not display their knowledge of these systems in neat sequential order but in clumps which the researcher must separate into neatly organised categories.

This chapter is organised into three main sections. The first of these (Part A) explores some of the pre-requisites to writing development in the normal child. Learning to write involves the orchestration of many processes and the development of knowledge, skills, understanding and aspects of physical and cognitive development. Within this section, many of the key prerequisites and contributory skills and concepts are explored. These are organised under three headings which are seen as central to spelling and writing development, namely

- ◆ spoken language and phonological awareness (3.2)
- ◆ the graphic development aspect of writing including the physical demands of letter formation and the perception and production of graphemic forms (3.3), and
- ◆ the development of symbolic representation and the communication of meaning (3.4).

The second part of the chapter relates to theories and models of spelling development (Part B, 3.5) and the third section considers the learning and

teaching of writing and spelling (Part C, 3.6).

For the purposes of discussion the various aspects of writing are considered in turn, with the final section drawing together the key points. Within each section, early seminal work is discussed together with more recent research evidence where this exists. Where possible, the research evidence is limited to that concerning normal young children in English speaking countries. Studies of adults and pathological evidence are included only where no other data are available.

PART A: WRITING DEVELOPMENT

3.2 Spoken language and phonological awareness

3.2.1 Introduction

A primary requisite for the normal child learning to write is that the child must understand, and have a good grasp of, the spoken form of the English language. Although writing is far more than direct encoding of speech, writing is usually secondary to the development of oral language.

3.2.2 Phonology

The separate sounds of speech are called phones and each collection of phones which the speakers of a language regard as the same is called a phoneme. The English language is generally accepted to have 44 phonemes (Perera, 1984). These phonemes form the basic elements of spoken language, and whenever words are used either in speech or in writing this involves phonological structures. Phonology can be defined as

> "the system of representation that all members of the human race use for producing and storing an indefinitely large number of words by means of a few dozen abstract, meaningless elements, the phonemes"
> (Liberman and Shankweiler, 1991, p.4).

3.2.3 Phonological awareness

Phonological awareness, an alertness to the constituent sounds in words or the ability to reflect on the sounds rather than the meanings of spoken words, has received much attention in the last few decades, particularly in relation to the development of reading ability. In the 1960s experiments began to assess young children's ability to make explicit phonological judgements. In general the results showed that many seemingly easy tasks caused great difficulties for children. As Bryant (1993) summarises in a review of the experimental evidence, by and large children are quite incapable of making distinctions which are perfectly obvious to any literate adult.

However, phonological awareness has been shown to correlate highly with success in literacy (Liberman et al, 1977; Rozin and Gleitman, 1977; Treiman and Baron, 1981; Mann, 1991). In the early 1980s there was some scepticism expressed about this, and Henderson (1982) questioned the role of phonological awareness in reading due to the evidence base not being very strong.

> "Despite the attractive and committed advocacy by Rozin and Gleitman (1977) and others, the central role of phonological awareness remains as yet no more than a plausible hypothesis"
> (Henderson, 1982, p.63).

This hypothesis has been further tested in subsequent work by Bryant and Bradley (1983) and Bradley (1988), which showed phonological ability at pre-school to be one of the strongest predictors of later success in reading and spelling, even after discounting the effects of factors such as I.Q. and mother's educational level. Research has also shown links between phonological processing skills and word recognition in children and adults (Bryant and Bradley, 1985; Perfetti, 1995). Many recent studies have focused on phonological processing abilities as determinants of individual differences in reading acquisition (e.g. Liberman and Shankweiler, 1991). Stanovich and West (1989) point out that, although correlations are high between the two, this still leaves some word recognition variance

unaccounted for, suggesting that a minimal level of phonological sensitivity is necessary, but not sufficient, for development of efficient word recognition processes.

Stuart (1995) concludes from her evidence

".. we do have data to support the view that early phonological awareness affects children's ability to exploit the alphabetic system, and so to develop a sublexical route from print to sound to meaning"
(Stuart, 1995, p.167).

Stuart also suggests that phonological awareness and sound-to-letter correspondence knowledge can affect the development of lexical as well as sublexical procedures.

Although the correlation between phonological awareness and literacy has been shown to be high, it is still unclear whether the links between the two are causal or reciprocal. Goswami and Bryant (1992) believe the former.

"Phonological awareness is a powerful causal determinant of the speed and efficiency of learning to read"
(Goswami & Bryant, 1992, p.49).

However, those children who have learned to read and write yet whose phonological skills have been shown to be poor suggest that the phonological route to reading and writing is not essential. Most researchers support an interactive view, with phonological sensitivity as both a contributor to and a consequence of learning to read (Perfetti, 1991; Ehri, 1989). Research seems to indicate that the relationship between the two is reciprocal rather than one directional (e.g. Alegria and Morais, 1991).

Although there is general acceptance that phonological awareness plays a role in reading, the role this plays in writing merits further study. Many teachers of early writers accept that children often vocalise when writing, and can be observed searching for the symbolic means to represent their speech. The exact nature of this awareness, and in particular the question of which 'unit' of phonology plays the most important part,

28

creates extensive debate. How might the skills of phonological awareness be described? Bryant and Bradley (1985) distinguish between two phonological awareness skills:

> "One is to work out the sounds in words. The other is to put words into categories ... which share a common sound"
> (Bryant & Bradley, 1985, p.67).

For the purpose of this study these two categories will be used as a framework for examining the relevant literature. Phonological segmentation will be considered first, followed by alertness to rhyme and alliteration and the use of analogy.

3.2.4 Segmentation of sound

The ability to recognise separate units of sound and to segment speech is of vital importance in learning to read and write. Orthographically, words are letter strings separated by spaces. These spaces, and, therefore, the concept of words as identifiable units, are of central importance to writing and spelling. Normal speech does not accentuate these spaces between words, and sometimes children have difficulty in hearing word boundaries. There is a great deal of evidence to show that children do not start school with the ability to segment speech into phonemes (Gibson and Levin, 1975), or to segment words into syllables or phonemes (Liberman, Shankweiler, Fischer and Carter, 1974), yet this skill would be vital for children to assemble spellings by using sound/symbol correspondences.

Although the Liberman et al (1974) study revealed that a large number of children had not developed the ability to detect syllables or phonemes by the end of one year in school, research suggests that instruction can play a role in developing this skill (Bradley and Bryant, 1983; Tunmer, Herriman and Nesdale, 1988). The positive effect of such training was questioned by Bradley and Bryant's research (1983) in which they examined whether phonemic awareness training could improve reading comprehension. This failed to show differences which were statistically

29

significant. They identified four groups. One received forty training sessions on comparing the beginning, middle and final sounds of words. A second group was additionally taught how these sounds were represented by the letters of the alphabet, while a third group learned how to categorise words semantically. The fourth group received no special training. Although the results of the four groups of children did show the positive effects of phonemic awareness training, the differences were not sufficient to be statistically significant. It would appear that whilst letter knowledge and phonemic awareness are important for the young child learning to read and write, it is somehow the linking of these two which is of central importance.

3.2.5 Phonemic segmentation

Detailed reviews of research studies on phonemic segmentation have been presented by Ehri (1979, 1984) and Downing (1984). The main elements of such research will form the basis of this section.

Phonemes are the smallest units of sound in spoken words, and many are represented by single alphabetic letters (Goswami & Bryant, 1990). The vast majority of children learn to talk quite naturally and master the phonology of language extremely well in their first five years of life. Phonemes are naturally strung together into word units, and children understand the differences between minor phonemic changes such **mat** and **bat.** Speech quickly becomes so natural and fluent that speakers are not overtly aware of the sound units as they produce or listen to speech but process the phonemes automatically. Children's knowledge of phonology is implicit rather than explicit. Although learning to read is not dependent on phonemic awareness, some research does show a strong correlation between children's ability to detect phonemes and the progress they make in learning to read (Stanovich et al, 1984; Tunmer et al, 1988). Tunmer and Nesdale's (1985) study of phonemic awareness in young children also measured reading ability. The children in the sample were drawn from the classes of six different teachers, and they were divided roughly half and half in terms of the reading instruction they had received. Three of the teachers adopted an eclectic approach which included a heavy emphasis on teaching letter-sound correspondences, whereas the other three adopted a

psycholinguistic approach "providing no incidental or formal instruction in [letter-to-sound correspondences]" (Tunmer & Nesdale, 1985, p.421). Although the two groups of children did not differ significantly in terms of their ability to segment phonemes, the children who received the former type of instruction, with explicit instruction in decoding, scored significantly better in reading achievement. This would appear to indicate that there are links between phonological awareness, even if this knowledge is implicit, and reading development in English. In other languages this may not apply.

Another study which evaluated the effects of training in phonemic segmentation and instruction in letter names and sounds was conducted by Ball and Blachman (1991). Ninety children were randomly allocated to three groups. The first received phonemic awareness training involving segmentation and letter/sound correspondence training. The second group received only the letter/sound correspondence training, and the third group had no intervention at all. The first group significantly improved early reading and spelling skills, although the second did not significantly improve their segmentation skills or their spelling or reading in relation to the control group. It would appear that letter/sound training alone does not lead to phonemic segmentation ability.

Phonemic segmentation is difficult because of the nature of the acoustic signal. As Adams (1990) puts it

"The phonemes of a word are acoustically invisible
from one another"
(Adams, 1990, p.73).

This acoustic invisibility is also commented on by Tunmer and Hoover (1992).

"Because phonemic segments do not exist in the acoustic signal per se but must be constructed from it, children must develop an awareness of an entity that is inherently abstract"
(Tunmer and Hoover, 1992, p.191).

31

As phonemes are abstract units, which are not discrete units in speech, phonemic segmentation and synthesis are not just simple associative memory tasks but highly demanding conceptual tasks (Ehri, 1979, 1994). The demands this places on children are considerable.

> "They must develop the ability to invoke control processing to perform mental operations in the products of the mental mechanism responsible for converting the speech signal into a sequence of phonemes"
> (Tunmer & Hoover, 1992, p. 191).

One reason for children's difficulty in distinguishing phonemes is due to the fact that phonemic segments are often co-articulated. Henderson (1982) cites Miller (1962) who states that the phoneme as the basis for the perception of speech should be rejected, as such a small unit would require an implausibly high rate of identification decisions. This is partly due to co-articulation, where the mouth prepares for the second element even when making the first (for example, start saying "do" then change it to "die"), and thus successive events exercise an influence on each other, causing difficulties with segmentation. The question of separating out the various units is also problematic, as can be seen with the previous example. The /d/ is dependent on the vowel pattern which follows. A pure vowelless /d/ is hard to achieve.

This difficulty in segmenting phonemes was also highlighted by Liberman, Cooper, Shankweiler and Studdert-Kennedy (1967). Consonants are often merged with a related vowel, so although the word **dog** has three phonemes it has only one acoustic segment. The three phonemes of **dog** will only be recognised by one who has the abstract concept of phoneme and understands the alphabetic principle upon which written language is based.

Despite the acknowledged difficulties which segmenting phonemes presents, many studies have explored young children's ability to perform segmentation tasks. Liberman and her colleagues (Liberman et al, 1974) developed a segmentation test which they used with four to six year olds. A series of words or syllables, each composed of four to six phonemes

32

was used. Each child was given a stick, and asked to tap out the number of phonemes in each syllable. The children were deemed successful if they could correctly tap out the phonemes for six consecutive words. At the end of the school year none of the four year olds were successful, only 17% of the five year olds were successful, and 70% of the six year olds were successful. Further testing of the reading ability of the six year olds revealed that none of the children who had failed the segmentation test were in the top third of readers, and half of those who failed the segmentation test were in the lowest third.

Early research into phonemic awareness was fuelled by the belief that if children had phonemic awareness they could learn to read by learning the letter-sound rules and applying these to printed text (the phonic method of teaching reading) and that the development of phonemic awareness was a precursor to the development of the ability to read (e.g. Gleitman and Rozin, 1977). However, the Brussels group of researchers found that ex-illiterate adults could manipulate phonemes intentionally, but that illiterate adults could not (Morais et al, 1979), showing that the ability to consciously operate on phonemic segments developed only after the ability to read had been developed. This study involved two groups of adult Portuguese. Both groups had been illiterate, but one group learned to read by taking advantage of an adult literacy programme. The tasks involved adding a phoneme to a word in order to make another word, and also deleting a phoneme from a given word to create another word. Some of the words used were valid, and some were nonsense words. Although some of the illiterate adults could manage some of the words, for example achieving 46% success in the addition task with real words, their overall results were far poorer than the literate adults. In particular they performed very badly on the nonsense words task.

Further studies in the 1980s offered support to the view that conscious phonemic manipulation developed after the ability to read. Work by Goswami and Bryant in 1990 showed that tasks requiring phonemic skills could only be completed successfully by children who have begun learning to read, and Goswami has stated that full phonemic awareness does not usually emerge until children have been learning to

33

read an alphabetic script for about a year (Goswami, 1995). Mann's research provided evidence that children learning to read in an orthography which does not relate phonemes and graphemes, such as Japanese, find phonemic tasks much more difficult than American children learning to read an alphabetic script such as English (Mann, 1986). In her study the children were asked to tap out the number of phonemes and syllables in given words, and although there was little difference between the two groups in relation to the syllable identification, there was considerable difference in relation to phoneme identification. This would again seem to support the view that knowledge about phonemes develops as a result of learning to read and write in an alphabetic script. The role of instruction is also supported by Morais and Mousty (1992) who say that phonemic awareness is a metalinguistic capacity (p.194) and that there are two main causes of phonemic awareness - linguistic development and alphabetic instruction - which are both necessary but not sufficient.

Treiman and Baron (1981) present results which suggest that the ability to count phonemes does not relate to reading ability in general but to a particular aspect of literacy - the ability to use sound-spelling rules. They differentiate between two types of reader, Phoenicians who use mainly sound spelling rules and Chinese who mainly depend on word-specific associations. The former seem to be better at phoneme analysis than the latter. If we try to establish a causal link, is it that children are good at learning spelling-sound rules because they are good at segmental analysis, or do children who know the spelling-sound rules do well on phoneme analysis tests because they can imagine the spellings of words?

The Brussels group now support the interactionist position on the relationship between phonemic awareness and alphabetic literacy: that alphabetic literacy is both a cause and a consequence of phonemic awareness, (Alegria and Morais, 1991) or that phonological sensitivity is both a contributor and a consequence of learning to read (Ehri, 1979,1994). This finding has generally been accepted, and the relationship between phonemic awareness and literacy acquisition has been called one of reciprocal causation. Perfetti sums up the present position.

"The consensus from the research is that the relationship between phonemic awareness and learning to read is not one-directional but reciprocal" (Perfetti, 1995, p.111).

Perfetti clarifies the implications of the research on phonemic awareness by stating that this reciprocity does not mean that phonemes are not important in learning to read.

"It rather reflects the invisibility of phonemic structures, i.e. the fact that specific phonemes are not an ordinary nor salient part of the perceptual experience of hearing words"
(Perfetti, 1995, p.111).

He makes the point that good literacy instruction can make phonemes more visible while promoting their mapping onto visible symbols, and that as literacy and phonemic awareness develop in tandem this implies that phonological training should not occur in isolation, but should be linked to word reading.

This reciprocity would appear to apply to spelling as well as to reading. Foorman et al's (1991) research concluded that early skill in phoneme segmentation was predictive of spelling performance, and improvement in segmentation skill was predictive of all aspects of spelling performance. In turn, early skill in spelling was predictive of segmentation performance.

Whilst the phoneme was thought to be the main unit of phonological importance by the Brussels group, others disagree.

3.2.6 Syllabic segmentation

As speech is continuous and does not have any genuine acoustic segments it has been argued that syllabic segmentation is easier for children than phonemic segmentation (Henderson, 1982; Gleitman and Rozin, 1977). This view holds that discrete phone chunks are not produced in a temporal row, but that phone sequences are carried out simultaneously and are integrated into syllables, which are the main articulatory unit and are speech motor units. Liberman et al (1977) demonstrated the

accessibility of syllables versus phonemes in segmentation experiments with children of four to six years of age. The children found it easier to identify syllables than phonemes, although their ability to isolate phonemes did develop as they got older. A possible criticism of the design of this research is that it involved the children tapping out syllables, which is relatively easy as the rhythm of the word indicates the syllables and tapping is a rhythmic activity. Treiman and Baron (1981) addressed this issue by asking children to identify sound units of phonemes and syllables and place a corresponding number of counters on a table top rather than tapping. Again, syllables proved to be easier than phonemes, and even five year olds were able to identify syllables in words.

This could indicate, however, that the design of some phonemic segmentation experiments has not generally taken full account of the cognitive demands these place on children. Calfee's (1977) work shows that it is often the way in which information is presented to children which influences whether or not they can "perform" as required by the researcher. When he offered pictorial support in the form of pictures on cards to represent the test words and the possible options for response, he found that virtually all of the kindergarteners and first graders with whom he worked could master the task very quickly.

It would appear that focusing on syllables is easier than focusing on phonemes because syllables are more readily isolated within speech, and some researchers argue that the syllable is the basic unit in speech perception.

> "..while the young child can focus on and manipulate linguistic meaning, he does not in any conscious way realize that his speech is literally composed of sequences of sounds. To the limited extent that the young child is aware of phonological properties of his language, he has greater access to syllabic segmentation than to phonemic segmentation. This is essentially because syllables map linearly onto the sound stream, while phonemes are highly encoded in the sound stream"
> (Rozin and Gleitman, 1977).

Read (1983) would also support this view.

36

"Words and syllables are relatively more accessible, morphemes and phonemes less so. The former are units of everyday parlance, which have proven rather difficult to define formally; the latter are creatures of linguistic analysis"
(Read, 1983, p.153).

English, however, has about forty phonemes but over a thousand syllables, which could create difficulties for readers and writers if the syllable played a key role in literacy. Carroll, Davis and Richman's (1971) children's word frequency index identified 17,602 words containing a total of 43,041 syllables. A further problem with syllables is that of definition, and dictionaries do not all agree on where boundaries within words occur.

3.2.7 Intra-Syllabic Segmentation: onset and rime

Recent interest has focused on intra-syllabic segmentation, and in particular on onset and rime. Adams (1990) states

"The theory is that the onset and rime of a syllable are separate but internally coherent psychological units"
(Adams, 1990, p.308).

Researchers such as Treiman (1985), Goswami and Bryant (Goswami and Bryant, 1990; Goswami, 1994) have identified that although children have difficulty identifying phonemes they are able to apply their phonological knowledge at the onset/rime level, dividing syllables into two distinct units, where the onset consists of those consonants before the vowel (if any) and the rime is made up of the vowel plus any following consonants in the syllable. By their nature these relate closely to alliteration and rhyme.

Treiman (1985) found that, even with training, eight year olds have difficulty splitting syllables anywhere other than at onset/rime boundaries. Bielby (1994) suggests that children's sensitivity to alliteration and rhyme shows that they are able to identify onsets and rimes, but believes that they do not spontaneously analyse them further.

37

"Onsets and rimes are the fundamental units of speech-sounds perceived by the alphabetically untutored child"
(Bielby, 1994, p.79).

The links between onset and rime and spelling are drawn by Goswami in her explanation of why learning the spelling patterns for rimes is a good way of organising the English spelling system (Goswami, 1995). Although the English orthography is criticised for its irregularity, Goswami uses examples to show how most spelling-sound ambiguity derives from changes in vowel pronunciation. If the vowel is considered as a rime, with its following consonants, greater consistency becomes apparent. Thus the vowel sound in **car, bar** and **far** is similar, but is different from that in **call, ball** and **fall**, which is different again from that in **cat, bat** and **fat**. Within its rime group, however, each is consistent.

The large number of syllables in the English language has already been referred to. Research by Stanback (1992) demonstrated that the 43,041 syllables of the 17,602 words in the Carroll, Davis and Richman (1971) children's word frequency index are made up by 824 rimes, 616 of which are in rime families. Thus the onset/rime is held to be easier than the syllable for children. The debate about this continues, as Nation and Hulme's (1997) investigations showed phonemic segmentation to be a more important predictor of reading and spelling ability than onset-rime segmentation.

Alegria and Morais review the range of recent studies and conclude

"Reading acquisition requires the discovery of the alphabetic principle, which implies segmental awareness; however, such awareness does not develop except through learning to read in an alphabetic system. Segmental awareness seems to be at the same time the cause and the consequence of reading acquisition"
(Alegria & Morais, 1991, pp.144-145).

3.2.8 Categorising words according to sound

> "The other aspect of phonological awareness, alertness to rhymes and so on, develops spontaneously, and is enhanced by auditory experiences like the rhythm, alliteration and rhyme in nursery rhymes that draw deliberate attention to the sounds, as distinct from the meanings, of words"
> (Bielby, 1994, p.78).

3.2.9 Rhyme

Children's knowledge of nursery rhymes has been shown to have a strong relationship with success in reading and spelling (Bryant & Bradley, 1985; Bradley, 1988; Bryant et al, 1989). This is perhaps due to the fact that sensitivity to rhyme and alliteration enhances children's phonological awareness and perhaps makes it easier for children to learn about sequences of letters, in particular those shared by words which also rhyme (Bryant, Bradley, Maclean and Crossland, 1989). A study of English four- to five- year old non-readers showed that alertness to rhyme and alliteration predicts reading ability and spelling ability three and more years later, even when controlled for intelligence (Bryant and Bradley, 1985).

The ability to recognise rhymes was shown to make a major contribution to spelling both directly and indirectly (Bradley, 1988). It helped children to analyse words within the syllabic unit and also made a significant contribution to the development of memory for letter strings, even after differences in age, intelligence, and reading and spelling skill had been taken into account. It has been argued (Bryant, 1990) that rhyme influences reading (and presumably writing) in two ways. One is a direct route which gives the child an effective way to learn about spelling patterns and sequences. The other is an indirect route as the ability to detect rhyme gradually develops into an ability to recognise and isolate single phonemes as well.

Some support for this relationship comes from research with children of 5.5 to 9.5 years of age by Nation and Hulme (1997). They found that rhyme and alliteration sound categorisation scores did account for

39

statistically significant variance associated with reading and spelling ability, but that they were poorer predictors than phonemic segmentation.

3.2.10 Analogy

This is a non-lexical procedure whereby a reader would process an unknown word by analogy with visually similar words of which the phonetic form is known. A phonetic/articulatory form is then assigned to the unknown word. Analogy has now been examined in relation to spelling, whereby a known form of a similar word is used to provide a model. Goswami and Bryant (e.g. 1990) have shown the use of analogy to be important. Goswami (1994) identified two types of analogy and found that children made many more analogies between spelling sequences that reflected rhyme than those sharing the same onset. In fact children did not use analogies between the beginnings of words at all (e.g. **beak** and **bean**) but only used analogy for words sharing a rhyme (e.g. **beak** and **peak**). As the two sets of words are visually similar, that is, sharing three letters, Goswami assumed that the phonological knowledge must be a key factor here. Testing whether rhyme was important was done by looking at words sharing the same sound but not the same spelling e.g. **head** and **said**, **head** and **bread**, and the latter was found to be more frequent. She concludes that the analogies were indeed the result of applying onset/rime knowledge to shared spelling sequences in words. Children with better phonological knowledge at the onset-rime level used more analogies than those with poor phonological skill (Goswami, 1994).

3.2.11 A continuum of phonological skills?

One's perception of which unit, the phoneme or the syllable, is most easily accessible to young children in their reading and writing will directly influence one's view of phonological awareness and its development. Some writers believe that children's phonological awareness develops sequentially. Treiman (1985a) found that children could segment into syllables before onset and rime, and could identify onset and rime before phonemes. She recommends that this sequentiality is addressed by educators, with children being first taught to recognise syllables, then to

40

separate these into onset and rime, at which point the correspondences between print and speech at the level of onset and rime would be introduced. Following success at this level, children would be introduced to the level of phonemes by firstly segmenting onset and rime into phonemes, then learning the correspondences between phonemes and letters (Treiman, 1991).

Treiman's (1985a) view of sequential development is supported by Goswami (1994) who holds that

> "there is a progression in the development of phonological skills. An awareness of syllables, onsets and rimes develops before an awareness of phonemes. This suggests that for most children, being taught about grapheme-phoneme correspondences (traditional `phonics') is not a good way into learning to read. In fact, phonemic awareness seems to develop largely as a consequence of learning to read and to spell"
> (Goswami, 1994, p.36).

In conclusion, although reading acquisition may facilitate phonological awareness, there is evidence that young children begin to develop these skills before they learn to read (Bradley and Bryant, 1983) and that such skills play a direct role in the early stages of writing. It has been suggested that there may be a sequence of phonological development (Treiman, 1993; Goswami, 1994) which could inform the teaching of writing. Whatever the sequence of learning, it must be recognised that young children are likely to face difficulties in segmenting speech which will create challenges for those trying to represent speech in writing by using sound/symbol relationships.

3.3 Putting pen to paper:

For the purpose of this study the word "writing" is taken to mean the process of representing meaning using pen and paper. It is accepted that the word can be used to refer to the physical aspect alone, or can refer to composition using a range of techniques. These vary, and include a broad spectrum of options from the use of computers operated by keyboards, joysticks or even breath, to the notion of writing by channelling

41

ideas through an intermediary. Barbara Cartland earns her living as a writer yet never puts pen to paper, preferring to dictate stories to a secretary. The late Jean-Paul Bauby, suffering from 'locked-in' syndrome, communicated his story with the help of an assistant who read through the letters of the alphabet in frequency order. He selected the appropriate letter by blinking one eyelid when the required letter was said (1997). Such fortitude and enterprise demonstrate the possible ways in which written communication can be achieved but the focus here is on normal development in young children in mainstream education. In this study the term writing will therefore be used to refer to the total process, meaning the composition of text plus the presentation of this on paper.

A further complication occurs when one considers when writing begins:

> "Is it when the child composes a readable message to serve some communicative purpose? Is it when the child uses letters to spell words with some approximate degree of accuracy? Or is it when the child makes some wiggly lines on paper and pretends that she is writing?"
> (Temple, Nathan, Burris and Temple, 1988, p.17).

Depending upon which interpretation one accepts, one's view of writing, and particularly of what should be researched, will alter. In this study children will be asked to write, and whatever the children produce will form the basis for study.

The development of graphic representation includes several closely connected elements of growth. The motor element of the task, a knowledge of conventional graphemes and writing symbols, and the understanding of the symbolic nature of print must eventually be co-ordinated to order to produce writing. Progress is not linear, with continuous growth and improvement, but irregular and recursive as the varying demands of the process vie for the child's attention and effort. Although each aspect of graphic representation will be considered separately, it is accepted that in reality these are closely inter-related.

42

3.3.1 Perception of graphemic forms

Children's perceptions of graphemic forms develop at an early age. Harste, Woodward and Burke (1984) and Lavine (1977) found that three year old children could distinguish drawing from writing when presented with a range of examples, regardless of their gender, economic or cultural background. The latter study (Lavine, 1977) established that 86% of the three year olds studied could identify samples of true writing as writing, with this figure rising to 90% of the four year olds and 96% of the five and six year olds.

De Goes and Martlew (1983) investigated whether 40 children from 4 to 6 years of age could sort a set of cards containing words, isolated letters, strings of vowels, strings of consonants, numbers and strings of punctuation symbols, identifying those which contained words. The children's responses were varied, and the researchers identified six different levels of approach to the task, but 50% of the children identified that words consisted of letters. A similar task involving numbers showed that these were clearly differentiated by 50% of the children.

3.3.2 The physical aspect of writing

Although print concepts and mark-making have been shown to develop from an early age, the physical demands of writing require a certain level of maturity and fine motor control. Writing is a complex perceptual-motor task, and the movements of skilled writing are so commonplace that it is easy to overlook their intricacy. A skilled writer can smoothly execute a structured sequence of co-ordinated movements, in which each movement occurs at the appropriate time in the sequence (Thomassen and Tuellings, 1983). The hand has 27 bones controlled by 40 muscles, mainly in the lower arm, creating a complex and sophisticated system. To write, the hand must be able to adopt a specific position for a sustained length of time with some force, and the various fine movements need to be made with a considerable degree of co-ordination. At the same time the body needs to remain still, with the movements of the fingers, wrist and arm gradually becoming more refined. It is recognised that very young children need to have reached a certain level of physical maturity before learning to write becomes possible,

43

and De Ajuriaguerra and Auzias (1980) suggest that the "elementary motor conditions are achieved around the age of six, but at a minimum" (p.68). In the early stages of grapheme production the physical demands require considerable effort which is tiring and which requires children to focus their attention letter by letter. With experience and practice this gradually becomes refined and takes up less focal awareness or attention, leaving the writer to concentrate on other aspects of the process. Writing movements become automatic for word or letter sequences, and the writer is able to execute a complex motor act as a unit or as an integrated sequence.

> "The exercise and development of these motor and praxic abilities will enable the movements to become organised and gradually to become smooth, quick, supple, economical, and automatic"
> (de Ajuriaguerra and Auzias, 1980, p.68).

This motor development will apply to normal, able-bodied children. For those with particular physical difficulties the motor control needed to be successful as a writer might relate to the manipulation of a computer keyboard or joystick rather than a pencil or pen. This demonstrates that although the physical mark-making described in this and many other studies is an important element of normal writing development, it is not vital to the mastery of the writing process and the communication of ideas through print. The exact relationship between the motor production of symbols and the cognitive process of writing is relatively unexplored, and is beyond the scope of the current investigation.

It is also the case that the graphemic code is not just about the typical movements made when writing a particular word, but must be a comparatively abstract description of the letter sequence which constitutes a word's spelling. Ellis (1984) provides many examples of spellers who cannot write but who can spell orally, and points out that a normal speller can "spell" in a variety of ways, each involving different motor movements. This includes spelling words aloud, arranging alphabet blocks, writing in capitals or lower case letters, typing, and even scribing in sand with one's toe. Some movements which have approximately the same form and function are

44

generated with completely different muscle systems, for example writing our name with left and right hand, writing on a blackboard as opposed to a flat surface, or writing with pen between teeth or toes. This indicates that the memory of a spelling can be accessed independently of the motor process. Skill transfer obviously occurs, as the skills acquired in practising one performance can be transferred to other performances, and this appears to be independent of muscle control.

This skill transfer seems, on the surface, to be explained by the abstract-program assumption - that motor programs are independent of particular muscles and are, therefore, more abstract than the muscles they guide (MacKay, 1982). However, this cannot account adequately for poor bilateral transfer. If an action sequence such as signing our name is represented abstractly, why does perfect transfer not occur when the unaccustomed hand is used? MacKay's (1982) proposed node-structure approach accounts for this by suggesting that a motor program is an action hierarchy and, therefore, a different motor program would be involved when identical actions are performed in reverse order.

Further support for this visual-motor distinction was provided by Frith (1985). She assumed that experienced readers and writers would have schemata available for conventional letter shapes but not for unfamiliar, invented shapes. Her study required adults and good- and poor-reading children to copy or reverse the stimulus they were shown. The results showed that copying a reversed letter caused some difficulties for adults and children, that reversing a reversed letter was no more difficult than copying it, but that letter-like shapes for which no perceptual or motor schemata were available were always more difficult to reverse than to copy. Frith also found that young weak readers had only weak schemata, and that similar effects were found with the non-preferred hand. This supports the view that not only do muscle commands exist in the motor schema, but that some more abstract representation must also be present.

The present study is based in mainstream classrooms and none of the young writers have abnormal motor difficulties. It must be noted, however, that the children's written representations will be affected by the extent of their physical control of the pen, and the automaticity of the muscle

45

movements necessary to produce the letters required. Judgements about their ability to write need to take account of the physical demands which writing presents. In relation to their spelling, it is possible that `false positive' and `false negative' spellings will occur in the writing samples because of immaturity in motor control.

3.3.3 Graphic development

The impulse to make marks appears to be a natural human characteristic, and Vygotsky (1978) sees the development of written language as part of "a unified, historical line" leading from speech, through make-believe play and drawing, to writing. If children are given appropriate tools and a surface on which to write they will usually begin to produce marks spontaneously. Cattell (1960) gave the normal age for this natural scribbling stage when provided with a pencil and paper as 18 months although, given a demonstration, children of a younger age will make such marks. Gibson (1971) supported this with further evidence, reporting that a child of 12 months will make marks on paper if given appropriate materials, and at 18 months will initiate scribbling on his/her own. This is more than merely a form of physical exercise or play, as children have been shown to lose interest in the activity when the ability to leave a trace is removed (Gibson and Yonas, 1968, cited in Gibson, 1971).

Children appear to progress from producing apparently random, unorganised scribbling through a recognisable sequence of development. Two significant studies by Hildreth (1936) and Legrun (1932) both classified children's early writing samples into five stages or levels, and the five levels were remarkably similar, beginning with scribbles and moving gradually to closer and closer approximations to conventional letters (see next page).

This early scribbling and mark-making is the precursor to both writing and drawing, and for young children the two forms of representation develop alongside each other. Research, however, tends to concentrate either on children's artistic development (e.g. Light and Barnes, 1995) or on early writing (e.g. Clay, 1975) which would appear to ignore the early inter-relatedness of the two forms.

46
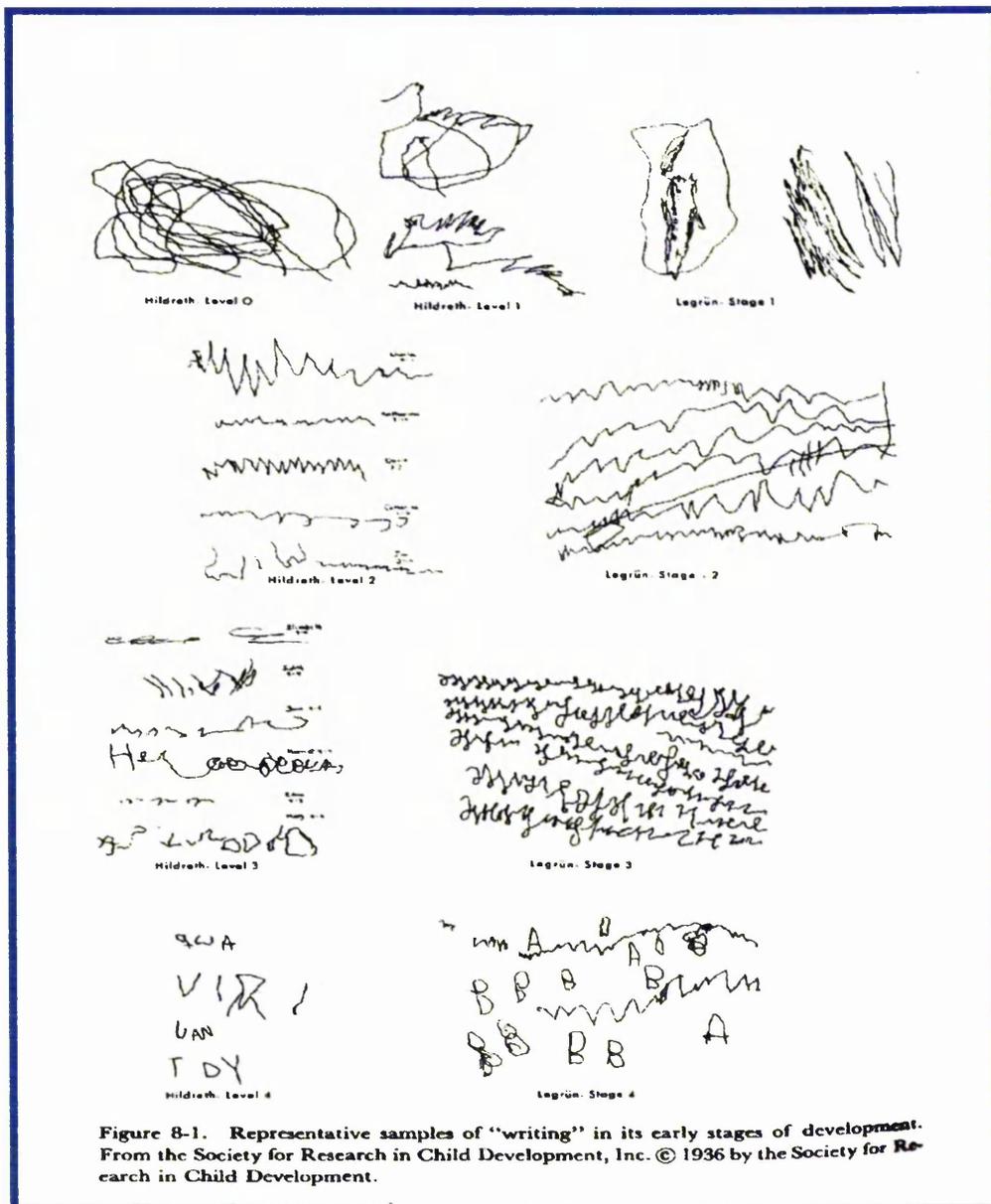
Figure 8-1. Representative samples of "writing" in its early stages of development. From the Society for Research in Child Development, Inc. © 1936 by the Society for Research in Child Development.

FIGURE 3.1 THE DEVELOPMENT OF YOUNG CHILDREN'S WRITING (SOURCE GIBSON & LEVIN, 1975,P.232)

Some researchers into children's early writing (e.g. Bissex, 1980; Ferreiro and Teberosky, 1982) do highlight the significance of drawings which precede and then appear alongside early writing. Kress (1994) comments that the writing samples he discusses in his work each had a picture with them, and states

47

" ..it is quite clear to me that the picture forms part of the whole text for the child; it seems to show the same conception expressed in non-verbal form"
(Kress, 1994, p. xi).

The movement from drawing things to drawing speech is seen by Vygotsky (1983) as a move from second order to first order symbolism.

".. the written language of children develops in this fashion, shifting from drawing of things to drawings of words"
(Vygotsky, 1983, p.289).

Parallels have been drawn between the ways in which children use drawings to represent objects and the way their writing develops. Whitehead (1990) describes how the standard representation of a house drawn by a young child is likely to be a square with a central door and a chimney belching smoke, even though this is unlike the majority of homes in Britain, and sees this representation as a cultural sign rather than artistic realism.

"This tendency to use a generalized sign is probably the bridging activity between thinking with actions, images and symbols and communicating through a conventional writing system"
(Whitehead, 1990, p.145).

Children do not strive for accurate representation in their drawing but rather symbolise, selecting the most salient features of the object to be recorded.

"The schemes that distinguish children's first drawings are reminiscent in this sense of verbal concepts that communicate only the essential features of objects. This gives us grounds for regarding children's drawing as a preliminary stage in the development of written language"
(Vygotsky, 1983, p.286).

Gardner (1993) summarizes the findings of Harvard Project Zero, a research project set up to examine children's symbolic development. In a longitudinal study the project looked at a range of symbol systems including language, pretence play, two dimensional representation (drawing), three dimensional depiction (modelling with clay and building with blocks), bodily expression, music, and number. They discovered this to be a complex area. `Streams of development' were identified, where development within each of the areas studied did not appear to relate to the other areas. They also identified four `waves' of development symbolic representation. At yearlong intervals, beginning at the age of two, they found that children go through a series of developmental crests which they termed waves. Gardner (1993) gives examples of how this development relates to writing. Initially, between eighteen months and two years,

"the child becomes capable of capturing in symbols his knowledge that there are events, that these involve agents, actions, and objects, and that these events have consequences"
(Gardner, 1993, p.74).

This originates in language, and specifically that used in symbolic play, and this spills over into other domains. The example relates to written representation. A child asked to draw a truck will make marks back and forth while saying `vroom vroom'. Although not conventional drawing, the child is enacting the process of driving rather than graphically depicting the truck.

The second wave, at about three, is termed "topological mapping." The child may represent a figure by drawing two circles, one above the

other, and call one the head and one the body. This captures the "general temporal or spatial relations of a configuration" (p.74). The third wave, digital mapping, occurs around the age of four. This "captures precise numerical quantities and relations" (p.75). The final wave occurs around the age of five, six, or seven when children show "an attraction towards 'notational' or 'second-order' symbolization"(p.76).

Gardner wonders whether the waves might represent the ways in which humans learn to construe meanings, which would mean that they are vital to be considered by educationalists.

3.3.4 Graphic production as symbolic representation

The key element in both drawing and writing is the extent to which symbols are related to that which they signify. Munn (1997) holds that the relationship between sign and referent forms the basis of a progressive categorisation of signs. The most basic sign is one which has a causal relationship with what it indicates, such as a footprint representing a person being present. The next category of signs consists of those which represent what they indicate, such as drawings, and the final category consists of symbols which have an arbitrary relationship with what they represent. Meaning cannot be derived from such symbols unless the social rule which governs the relationship is understood. Using such a categorisation system demonstrates that drawing is indeed a precursor to the more 'advanced' form of representation which writing reflects. It is expected that many of the children in the present study will incorporate drawings into their early 'writing'. Symbolic representation is discussed in more detail in a later section.

3.3.5 Refining the marks: learning English letters

Writing in English requires the use of 26 letters of the alphabet presented in conventionally accepted sequences to represent words and meanings. The experimentation or scribbling of young children can produce known letters, particularly those related to circles or simple straight lines,

almost accidentally in the first instance. Gradually, however, a writer must learn the visual identities of each letter.

The complexity of this learning is considerable. Children need to master the representation of the 26 letters of the alphabet in both lower and upper case forms. Given that the two forms of the letters **c k o p s u v w x y** and **z** are similar in shape but different in size, this means that children need to learn 41 letter forms plus the alternative printed form of **a** and **g,** making 43 basic allographs. Some of the differences between the graphic shapes of letters are minor, and several letter forms if rotated or reversed make valid but different letters. Thus small features and details plus orientation are important. All parents and teachers of young children know that inexperienced writers experiment with letter formation and frequently transform letters, causing apparent mistakes. Perceptually children of three, four and five are learning that in life real objects can be rotated and reversed and although the object is visibly transformed, it actually stays the same. That the same is not true of letters on a page needs to be learned, and children need to accept and understand the need for conformity in letter shape and orientation. Although many four and five year olds do rotate and reverse letter forms, this is generally resolved by the age of eight. The extent to which lower case letters change their identity if rotated is demonstrated by Clay (1975) in the following table.

TABLE 3.2 CHART TO SHOW HOW ORIENTATION OF LETTERS CAN CREATE LETTER-LIKE FORMS (SOURCE CLAY, 1975, P.63)

Clay (1975) described how young children explored the ways in which a letter can be rotated yet still retain its identity and states

> "Many of the `errors' in children's creative writing at this early stage must be regarded as indicators of this flexibility which is essential for the complex learning to be mastered"
> (Clay, 1975, p 63).

Some of the regular `confusions' which are recognised by educators include **b/d**, **n/u**, and **p/q**. Such difficulties will affect the spelling of young children and it must be acknowledged that the reader and researcher may not always be sure whether an error is due to a poor grasp of letter orientation or poorly developed spelling. This particularly relates to those letters whose reversals or rotations create a valid alternative letter. For example the reversal of **j** can appear to be **i** with a ligature.

Adams (1990) registers further difficulties which children face. She notes that letters are graphically abstract, and have no prior iconic significance. Letters are also graphically sparse, composed of rather minimal visual features, and they are highly confusable for young children. Letters also vary in font and size.

> "The hard part about learning the visual identities of letters is that they were not designed with an eye towards visual distinctiveness or memorability"
> (Adams, 1990, p.346).

To summarise, research findings show that graphic production begins in early childhood and develops from scribbling to drawing to letter production. A child of five can usually identify a letter as a letter, even though he may not be able to identify or name it, and the ability of children to represent letters correctly on paper is affected by the stage of their perceptual development. Some recent research has examined graphic development in greater detail and suggests that there might be a linear development. The child starting to make random marks would progress to scribble waves, letter-like spelling, then the use of random letters (Gill, 1992). This type of behaviour may be evident in the present study.

This gradual development from experimentation towards the production of conventional letters is not necessarily dependent upon teaching as it is evident within environments where no formal instruction occurs such as kindergartens, and across a range of educational provision. A study of American children enrolled in different types of pre-school programmes examined whether the type of educational provision was a significant factor. Children were assessed for their knowledge of function, form and conventions of print. All children acquired basic `pre-reading concepts about print' and the type of instruction was not a deciding factor in acquiring this knowledge (Casteel and Isom,1989).

3.3.6 Understanding the relationship between phonemes and graphemes

In addition to learning which symbols the English writing system allows, the young writer has to master the ways in which particular groups of symbols relate to spoken language, and therefore to meaning. Read (1986) suggests that this development is rather lengthy.

> "During a period of about three years, they try out various hypotheses about the relation of written language to objects and then to spoken language"
> (Read, 1986, p.107).

Ehri (1984) considers that written English includes two basic types of spatial symbols, one nested within the other.

> "Horizontal sequences of letters separated by empty spaces symbolise words. Letters within words symbolize phonetic segments which are blended together in pronunciations"
> (Ehri, 1984, p.120).

Becoming literate and learning to read and write in an alphabetic orthography requires the child to understand these spatial symbols and to learn the alphabetic principle. To become writers children need to understand that there is a direct link between speech and writing, and that

53

there is a system, albeit irregular, whereby certain print forms represent certain sounds. This is sometimes referred to as sound-symbol correspondence, which is an inaccurate and inadequate description (Liberman and Shankweiler, 1991). The process involves more than learning to associate a visual shape with a sound, but entails learning how the visual shapes relate to the phonology of the word. Ehri acknowledges the contribution of phonological awareness, but suggests that this is only part of the process.

"Explicit phonological awareness appears to be necessary, but not sufficient, for acquiring grapheme-phoneme correspondence rules"
(Ehri, 1989, p 192).

The forty four phonemes of the English language are represented in writing by the 26 graphemes or letters of the alphabet. In some cases the same English phoneme can, therefore, be represented by several alternative graphemes or letter strings. Dewey concluded that in English there are on average 13.7 possible spellings per sound, but only 3.5 sounds per letter (Dewey, 1971). There are thus fewer ways in which any given grapheme can be pronounced than the ways any phoneme can be represented in written form, making writing a far more challenging task than reading.

The phoneme/grapheme ratio varies according to the selection of units. Wijk (1966) identified 46 phonemes corresponding with 102 graphemic patterns, making an approximate ratio of 4:9. Hanna et al (1966) distinguished 52 phonemes and 170 graphemic correspondences, giving a ratio of 4:13. Whatever the exact figure, this demonstrates that the number of ambiguous correspondences and the amount of ambiguity are greater in spelling than in reading, which creates a significant challenge for the young child learning to write.

Children's understanding of the connections between speech and print develops at varying rates. Not all children start school with this skill, and even many 7 year old children had a poorly developed word concept

54

and did not have a proper understanding of the connection between speech and print (Lundberg and Torneos, 1978). The complexities of developing this concept are considerable, and the 5-7 year olds in the present study are expected to show a range of understanding of the speech/print relationship.

> "To gain the concept of a unit of print the child seems to need to do several things simultaneously. He or she must classify, for example, all letters as having something in common, despite their evident differences. He or she must also recognise that these letters participate in some complex form of serial relationship with each other. e.g. **T** before **o** before **m** in the boy's name. As well as doing these with both the spoken and written forms of the letters, the child must also match these two elements in a one-to-one correspondence"
> (Watson, 1984, p.100).

3.4 The message concept

For mark-making to become true writing, that is, communication through graphic forms, children must develop the message concept. To become a writer the child needs to understand that print carries a message, and that this message is constant. When the child realises that one can graphically represent not only things but speech this represents a symbolic maturity which is highly significant, transforming writing "from a second order symbolic act to a first-order symbolic act" (Birnbaum and Emig, 1983, p.97).

In the written language symbol system there is a complex relationship between meaning and form. The writing symbols - the letters- relate to another sort of symbol, words, which in turn represent meaning. To grasp the alphabetic link between graphics and the spoken word (i.e. to construct a second order symbol system) talk must become a thing for children so that it can be represented in visual form.

> "There is a critical moment in going from simple mark-making on paper to the use of pencil-marks as signs that depict or mean something. All psychologists

agree that the child must discover that the lines he
makes can signify something"
(Birnbaum and Emig,1983, p.286).

This "discovery" is key here. How do young children make such discoveries,
do all children make these discoveries in similar ways and at similar ages,
and does classroom practice play a significant role in this?

3.4.1 Meaning-making and classroom practice

Until the present decade, teachers in British schools have taught
children to write primarily by means of the child copying the adult's words,
often initially writing over the teacher's writing then by copying underneath
the written text, and many infant teachers still make use of this method.
Along with tracing exercises this approach was widespread, and children
were often provided with the message of the text by the teacher, sometimes
by the adult adapting the child's dictation to fit the intended purpose. This
method of teaching divorced the secretarial and the compositional aspects
of writing, with the teacher being very much in control of the composition
and the creation of the text, and the child merely copying what was
provided. The cognitive challenge was removed from writing, reducing the
need for the young writer to see communication as central to writing.

Clay's study of young children (1975) was amongst the first to
consider the message quality of early writing. She listed the possible stages
of understanding of message quality which a child might go through as
follows;

- the child has a concept of signs
- the child has a concept that a message is conveyed (but this
  is verbal only)
- the child copies a message and knows approximately what it
  says
- the child uses repetitive sentence patterns
- the child attempts to record own ideas
- the child successfully composes.

Research in the 1980s (e.g. Read, 1986; Ferreiro and Teberosky,
1982; Harste, Woodward and Burke, 1984; Calkins, 1986; the National
Writing Project, 1985-89) added to teachers' understanding of the writing

process, and this helped to create a shift towards a generative approach where children's emerging writing abilities are accepted and valued. The view of writing as a means of communication is central to this. This has had implications both for teachers and children, as the teacher who encourages a generative approach is no longer directly controlling the writing events. In altering the role of the adult role model it has also become obvious that children do not always learn about the purposes of writing, that is, the communication of information or message, in the same ways or at the same rate.

In classrooms today young children may be asked to write, and then asked to tell the adult what the writing "says". Some children can and do answer such a question, whereas for others the question creates bewilderment and unease. This shift in classroom practice has helped to make evident the fact that not all young children realise that writing can be read, and in particular that their own writing contains a message. There are differences between children in relation to how and when the message concept develops, and exactly how the development of the message concept relates to the development of writing and spelling is as yet unclear. It is hoped that the present study may shed some light on this aspect of writing development.

A limited number of studies have considered the message element of writing. Luria's study (1983) showed that initially the act of writing seems to be an end in itself, with children who are asked to write down a dictation starting to make marks even before a word or phrase has been given. Luria traces the 'prehistory of infantile writing', identifying the early stage as one which involves the child scribbling in imitation of an adult activity but having no knowledge of the functional significance of writing, and not using it a means of recording specific content.

In Luria's study, when asked to recall the content of the writing, some children did not look at the paper but at the ceiling. Their behaviour was of remembering rather than reading, showing that for these children writing was not related to remembering but was purely graphic. In later stages differentiation begins, with the symbols acquiring a functional significance and children begin to represent graphically the content to be

written down. Thus, for Luria, the act of writing precedes the understanding of its purpose.

"it is not understanding that generates the act, but far more the act that gives birth to understanding. ... Before a child has understood the sense and mechanism of writing, he has already made many attempts to elaborate primitive methods; and these, for him, are the prehistory of his writing"
(Luria, 1983, p.276).

"... we are convinced that an understanding of the mechanisms of writing takes place much later than the outward mastery of writing" (op cit, p.270).

How does the relationship between this "outward mastery" and the symbolic understanding develop? One study which illustrates this is that of De Goes and Martlew (1983). They examined the graphemic development of 34 children of 3-6 years attending either a nursery or a first school. In the first part of the study children were asked to write anything they wanted, including their name, and were also asked to write specific phrases which were dictated to them. The second element of the study was to ask children to copy and write isolated words, presented as letters painted on wooden blocks. The word was read to the child, the child repeated it, then was asked to copy it, with the fact that the word was made up of separate letters emphasised. When the 'copy' was finished the blocks were taken away and the child was asked to write the same word again, with no mention being made of the copy which had just been made. The researchers were looking for the child's ability to recognise the word as a unit and to use his/her own copy as a model for rewriting, not the quality of the reproduction itself.

The results of this study led to a series of seven stages being identified. Level 1 was characterised by no distinction between the scribbles produced in either session. The marks produced bore no resemblance to the objects referred to, and tended to be circular or elliptical or straight lines which went from one edge of the paper to the other. Some children scribbled continuously until asked to stop, with action appearing as important as the marks produced. Children sometimes looked at the blocks

before copying, but did not look at them while copying. When asked to rewrite they made no reference to their own 'copy' but made new scribbles.

Writing categorised as Level 2 showed some resemblance between marks made and the objects, but no distinction made between drawing and writing. Marks were not merely scribbles, but tended to be units or closed shapes. Not all letters were reproduced when copying, and these were not always presented in a linear form. Children did not rewrite using their copy. During the dictation at this stage there were some refusals, with children stating that they were not able to write.

Level 3 writing still showed no distinction between writing and drawing, but children tended to make pictographic representations (e.g. four flowers drawn). When copying, some of the letters were represented in a non-linear fashion. Some children held the blocks or moved them closer, which the researcher says involves them altering the model as the word is not seen as a single unit. Children did not use their own copy in the rewrite. Random drawing and unrelated letter shapes were likely to occur. Children saw writing as drawing, with the model word as a set of shapes to be copied.

Level 4 was characterised by free writing in which children used letters to write their own name, though not always correctly. Dictation still produced a pictographic representation, and copying resulted in fairly good reproduction of letters in the correct order. Children used their own copy when rewriting.

At Level 5 children were aware of the distinction between writing and drawing. Children wrote their own names. In dictation they wrote strings of letters, which generally did not correspond to the sounds of words though sometimes the first letter was correct. Words were copied easily and without distortions. When asked to rewrite, the children did not hesitate to use their own copy.

Level 6 involved copying and rewriting as at level 5, but at this level children refused to write during dictation, stating that they could not. This shows their awareness of conventions.

Only one child was judged to be in the Level 7 category. In free writing he would only produce what he could write correctly. In dictation he

produced identifiable words (which deviated from conventional spellings). Copying and rewriting were done appropriately. This child seemed to be aware of the symbolic nature of print.

This study was repeated with children of a higher socio-economic group who appeared to reach the different levels of awareness at an earlier age. This would seem to indicate that the development of symbolic representation can be fostered and can flourish in an appropriate environment, rather than being merely maturational.

Although the De Goes and Martlew (1983) study provides interesting information concerning children's development of symbolic representation, this essentially involved children being asked to represent a given "message" of isolated phrases. This method enables the researcher to match the symbols produced with a known message, but its prescription takes ownership and creativity away from the writer and treats writing in a fairly mechanical sense. The first part of the activity did allow children to write anything they wished, but meaningful communication was not central to this whole experiment.

Another study which did not require children to organise their own writing was conducted by Ferreiro (1985). Its focus was the relationship between oral and written language, so the message was provided for the child to write. Again this study excluded the intention of communicating messages which is central to the writing process and children did not organise their own behaviour. The research did throw light on how the children analysed the written language symbol system.

In Sulzby's (1985) study children were invited to write stories and were given a specific topic. She found that the children approached this task in many different ways, and their behaviour included speaking, drawing, mark-making and writing in various combinations. She concluded that the writing systems she observed were "part of a many-featured repertoire, not a strictly developmental sequence" (1985, p.149). Sulzby's work demonstrated that when the content of the writing features as part of the research, the results offer a further dimension for consideration. She also identified some children who chose not to write.

60

3.4.2 Children who choose not to write

In addition to Sulzby (1985), other researchers have encountered some children in their studies who refused to write, apparently because they understood what writing was and knew that they were not able to do this (Luria, 1983; De Goes and Martlew, 1983). This recognition occurred as the sixth stage identified by De Goes and Martlew, and as the third of four stages identified by Luria, indicating that this is regarded as a fairly advanced behaviour. Such children have understood the message concept and have understood the need for conventional representation within writing. Their reluctance to write indicates a lack of confidence in their own ability to match convention, but also indicates significant understanding of the whole writing process. Sulzby (1985) found a similar reluctance to write in her study and concluded that,

> "Among the kinds of knowledge that children have is the knowledge that you can refuse to write. If you have a notion of what a task demands, you can assess whether or not you can do it. These children all knew conventional written graphics and spelling for at least one word, their own name..... They could compare their ability to write their name to the task of writing a story and could say: "I can't do that."
> (Sulzby, 1985, p.149).

A further category of young writers may willingly produce a range of marks or even conventional letters on paper, yet know that they unable to 'read' these. Such children have partially realised that writing has a symbolic function, but believe that the reader and the writer perform different roles. The writer makes marks, but it is the reader, according to their understanding, who ascribes meaning to the print. Smith and Elley (1998) consider that those who say "Tell me what it says" or "It's about the holidays" are expecting the adult or skilled reader to provide a more detailed reading of the text.

> "Reading the message was the province of older people who knew how to turn marks into sounds.

Meaning was not considered by the writer as fixed in place by the text, but was a function of the reader" (Smith & Elley, 1998, p.18).

3.4.3 Summary

The relationship between symbol and message appears, then, to begin as a pictorial one. Vygotsky described the writing development of children as shifting "from drawings of things to drawing of words" (1983, p.289) and in terms of the symbolic nature of writing this would appear logical. The child begins with representing the concrete by drawing the object, and as knowledge of the relationship between speech and the abstract graphemes develops, the child becomes more able to encode the actual intended message conventionally. In between these stages there may be others, relating to the child's intention and to the relative success with communicating messages, and it is intended that the design of the present study will offer further information on this aspect of development.

Few studies of young children's writing have been designed to consider their awareness of symbolic meaning and of the communicative purposes of print. Some studies, by their very execution, cannot take account of this, as the researcher only analyses completed writing samples and does not observe the process of constructing these (e.g. Gentry, 1977, 1981, 1982). In such studies, any writing which cannot stand alone in communicating to the reader is classified as pre-communicative. This type of research could be described as assessing orthographic development rather than writing development.

As the message concept is an abstraction, it cannot be measured. In this study the manifestation of the presence of the message concept in children's writing will be inferred from children's behaviour (see Chapters 4.7 and 5.2).

This study aims, then, to consider the development of the message concept in relation to graphemic representation. This will be done alongside a study of the development of children's progress from invention to convention, which, it is expected, will reflect the view of Ruddell and Ruddell;

"Beginning writers progress through stages from drawing or scribbling marks on paper to printing with invented or conventional spelling to creating written texts as permanent representations of assigned meaning"
(Ruddell & Ruddell, 1994, p.88).

PART B: THEORIES AND MODELS OF SPELLING

3.5 Theories and models of spelling

3.5.1 Introduction

Having considered the early challenges which learning to write presents, let us consider spelling and how the conventional representation of words might be achieved.

"Contemporary researchers have redefined spelling, not as a low-level, rote-memorization task, but instead as a higher-level cognitive skill"
(Phenix & Scott-Dunne, 1991, p.8).

This view of spelling as a complex cognitive skill is central to the present study. Cognitive theories of spelling development have their roots in the study of normal skilled reading, in various studies of memory, and in the study of patients with brain damage from strokes or accidental head injuries. Such research has provided a large body of evidence which has added to our understanding of how the human brain operates in relation to print, although we are still not in a position to fully explain the process. Much of this research relates to reading rather than writing, but it can help us to explore how the brain copes with the printed word.

Successful and proficient spellers have usually reached a stage where most of their spelling is seemingly effortless. Their writing, whether manually formed with pen on paper or produced via a keyboard will "flow" with little concentration or attention needing to be allocated to the production of correct spelling. This skilled behaviour has become automatic. However, the label of automaticity can make us assume that such behaviours are

63

easy, and our natural instinct for language can make us take for granted an ability which is awesome.

> "The effortlessness, the transparency, the automaticity
> are illusions, masking a system of great richness and
> beauty"
> (Pinker, 1994, p.21).

Skilled writers draw, apparently effortlessly, on a "bank" of words, a lexicon, which has been committed to memory. These words may have been memorised in either a conventional or incorrect form, but their retrieval from the mental store appears to occur with minimal drain on attention. The way in which the human brain masters written language and the complexities of the orthographic system, and the ways in which information might be committed to, stored in, and retrieved from the memory, are not yet fully understood.

> ".. the mechanisms involved when word spellings are
> learned, recalled and retrieved have so far eluded
> explanation"
> (Goulandris, 1992, p.143).

Since early neuro-psychological studies of dyslexia by people such as Wernicke in the late nineteenth century, it has generally been suggested that there are two main routes to both reading and spelling, the phonological and the lexical, and the independence or interdependence of these routes has been the subject of much debate.

This section is structured in the following way. Firstly, the importance of the words to be spelt will be considered. A brief look at automaticity will follow, with the remainder of the section devoted to a consideration of how the lexicon is developed, organised, and used.

3.5.2 The importance of the words to be spelt

Any attempt to describe the spelling process in relation to the English language is dependent upon a consideration of words to be spelt, and research papers frequently make a distinction between `regular` and

64

'irregular' words in the debate about theoretical frameworks (e.g. Holligan and Johnstone, 1991). However, regularity is not absolute and is only interpretable in relation to a set of hypothetical rules. By adding to the rules such regularity can change. A definition of these terms is therefore necessary to clarify their usage.

Regular words are those which it is considered possible to spell using a set of phonological processes that rely on alphabetic knowledge and the rules and regularities of English spelling. For the purposes of this study regular was taken to refer to the regularity and frequency with which particular graphemes, blends or digraphs matched specific phonemes. Carney (1994) states that, in theory, the alphabetical principle requires that "a given phoneme is represented by a constant symbol, but also that the symbol involved does not represent other phonemes" (p.15) and this requirement is known as biuniqueness. English does not have a consistent phoneme-grapheme relationship. However, the individual phonemes and graphemes do vary in what Carney terms "their divergence from biuniqueness" (op cit). It is this divergence which leads to the distinction between regular and irregular spellings, with regular spellings composed of the more frequently occurring sound-symbol relationships.

Irregular words are those which do not conform to regular phoneme-grapheme correspondences and which often incorporate morphemic or syntactic information. Such words cannot be assembled using grapho-phonemic knowledge alone, but, it is suggested, require a different set of processes. Lexical processes, using word specific spelling knowledge, are taken to be vital for efficient spelling of such words.

Such definitions do not determine the way in which the brain deals with reading or spelling, but they do indicate a range of possibilities. It would be possible to assemble "regular" words from grapho-phonic knowledge or to retrieve them from memory, whereas irregular words by their very definition cannot be assembled but must be retrieved from memory, with the writer relying on visual, morphemic and orthographic knowledge in order for the words to be spelt correctly. It may be that different languages make different cognitive demands, but the present study will focus on the English language.

65

Some researchers make use of invented or 'non-words'. Although the use of such letter strings can shed light on a speller's ability to assemble spellings from known grapho-phonemic associations and from analogy, these words cannot, by their invented nature, be 'known' to a writer. As this study is focused on the development of conventional spelling, the evidence from studies of 'non-words' will be considered very selectively.

In developing conventional spelling, writers must develop ways of re-presenting both regular and irregular words, and early attempts to explain this ability identified two routes, the phonological and the lexical, which might explain our ability to spell.

3.5.3 Phonological, non-lexical or assembled route to spelling

If writing is seen as the encoding of sound then a phonic mediation model of spelling could account for spelling performance within an alphabetic orthography once the graphemes have been learned and the grapho-phonemic relationships are understood. A writer would begin with the meaning of the word to be written then access the phonemic form of this from the phonemic word production system. The writer would then use his knowledge of phoneme/grapheme correspondence to create a spelling for the target word. The Russian neuro-psychologist, Luria, supported this view.

> "Psychologically, the writing process involves several steps. The flow of speech is broken down into Individual sounds. The phonemic significance of these sounds is identified and the phonemes represented by letters. Finally, the individual letters are integrated to produce the written word"
> (Luria, 1970,p.323).

This route is variously referred to as the phonological route, phonological spelling, assembled spelling and phonetic spelling, the phonic mediation theory, or phoneme to grapheme correspondence system (although the units of conversion can either be phonemes or combinations of sounds) It can only produce correct spellings within English orthography

for words which are phonetically regular. It can produce plausible spellings for non- words, and can represent the sound structure of irregular words.

This analysis, however, comes into difficulties when English homophones are considered. The pronunciation of such words is the same, but the spelling is determined by the meaning which is to be conveyed, and a phonic mediation model provides no means of selecting the appropriate spelling of homophones (e.g. **rain, reign** and **rein; so, sew** and **sow; shoot** and **chute**). Were phonemic representation alone involved in spelling, misspellings of homophones would be regular rather than occasional.

This model also does not explain how the writer would select the conventional spelling for a word when there is a range of possible phonemic representations (e.g. **rane** and **rain**), or how writers can write nonsense words. It cannot account for how spellings of irregular words might be produced. Our ability to spell words which contain the same sound yet which are written in different ways (e.g. **suit, newt, route**) and our facility with writing words such as **boot** and **foot, mint** and **pint, worm** and **form**, where two different sounds are often written the same way, demonstrates that orthographic patterns can be learned on an extra-phonological basis (Rozin & Gleitman, 1977).

Occasional errors in the spelling of homophones can be taken as an indication that phonemic representation of words does play a part in the retrieval process (Ellis, 1984). Such a non-lexical phoneme-grapheme translation channel of this kind cannot provide an adequate model of spelling competence, however, and a reliance on phonically mediated spelling would be a highly error-prone procedure for a writer to use as a primary process (Simon and Simon, 1973).

It is clear that the phonological route alone is insufficient to explain how we spell. In addition to a phonological route of spelling we have to consider a lexical route, with the conventionally correct letter sequence for each word committed to memory.

3.5.4 Lexical, sub-lexical or addressed route

"The nature of the English spelling system dictates that
reliable spelling must be done by retrieving spellings

67

from a word production system rather than by assembling them from their sounds"
(Ellis, 1984, p.97).

The lexical (or word-specific) route which enables the retrieval of spellings of known words from an orthographic or graphemic output lexicon has been postulated as the way in which writers can cope with the irregularities of English orthography. Word-specific knowledge is stored in the brain, and it is assumed that such knowledge is built up with exposure to the word in question. Regularly used words are therefore likely to be known.

With relation to writing, the meaning of the word or the sound of the word must be the writer's main means of accessing stored words. A word's spelling will either be 'known' or 'not known' (although this will not necessarily equate with correctness and accuracy of spelling). If a word is known, it can be retrieved from memory. If the word is well known this retrieval will appear effortless and automatic. The resulting written form may be correctly spelt or incorrectly spelt. This could relate to the accuracy of the lexical entry, or could be to do with a physical inaccuracy such as a slip of the pen or a mistype on a keyboard. As the sound of the word may have more than one form of representation within the lexicon, the writer may have to use his knowledge of meaning to decide which alternative to use.

3.5.5 Automaticity and lexical access

The model of automatic processing in reading put forward by LaBerge and Samuels (1974) has been considered with interest by teachers and researchers. At the heart of this model is attention. The human mind has limited capacity to process information, and the restriction comes from the limited amount of attention available for information processing. Attention can be thought of as the effort or energy used to process information (Samuels, 1994). When learning a new skill, we need to devote a great amount of attention to its performance, but with practice the skill becomes less demanding of attention, and can often be performed along with one or more other tasks. Practice helps us to move from attention-intense to attention-free or automatised behaviour.

The model of automatic processing built upon earlier views of skill learning which considered that there are three phases in the development of any skill. These are the cognitive, mastering and automaticity phases, which occur in that order, but are really one continuous process without distinct boundaries. In a complex skill such as reading or writing these phases continually recur as the learner meets new challenges. The cognitive stage is that at which the learner is finding out what to do. Luria referred to this as getting a preliminary fix. Mastery involves practising until the task can be done with a high level of accuracy, then automaticity follows, and signifies over-learning (that is, practice beyond the point of mastery).

As writing is a complex, multi-levelled skill involving the orchestration of many skills, learning to become skilled or automatic in some parts or all of this is essential, particularly if memory space is to be made available for composing.

> "Writing proficiency is advanced when writers successfully automate what could be termed lower-order skills relating to the transcription aspects of writing. When the majority of words used can be run off without having to focus on spelling, and clause boundaries are automatically demarcated by appropriate punctuation and capitalization, the writer is relieved from having to devote conscious attention to these operations. The writer can then focus on the higher-level operations needed to maintain an awareness of overall global aims, either in accordance with a pre-specified plan or integrating new ideas which evolve in the course of composition"
> (Martlew, 1983, p.305).

Within writing there are several skills which eventually become automatic, in particular the physical or handwriting side, and the spelling. The focus in this study is particularly on the spelling, although the possible interrelationships must be acknowledged, and could perhaps form the basis for future study. Perhaps it is the automaticity of handwriting which releases attention to focus on spelling, and the automaticity of spelling which helps composition? This view has been put forward by Peters (1985) and others.

> "It is only when we have achieved spelling that is
> automatic, predictable, and infallible that we are really
> free to write with confidence, with no backward glances
> to see if a word 'looks right', and with no offering of a
> less precise synonym or phrase because the right one
> is difficult to spell"
> (Peters, 1985, p.5).

However, little attention has yet been given to the question of whether automaticity is a valid concept in relation to spelling. Nor does the use of the term tell us anything about the process itself.

> "To say that an action has become automatic, of
> course, does not explain what has happened; it does
> not put an end to further questions"
> (Henderson, 1982, p. 291).

In using the word 'automaticity' the writer is not making any value judgement about the ease or difficulty of the behaviour, merely describing how as humans we are able to process certain aspects of written language in an extremely skilled manner while concentrating on other things.

In some explanations of skill development the term automaticity is taken to refer to mastery which includes a high level of accuracy, for example MacKay states

> "Given enough practice, aspects of an action hierarchy
> can become automatic, that is, rapid, error free,
> effortless, and unconscious in execution"
> (MacKay, 1982, p.503).

Samuels (1994), in relation to reading, states

> "In general, if a student is automatic, there is a high
> level of accuracy combined with speed"
> (Samuels, 1994, p.827).

However, it is obvious that this does not necessarily relate directly to spelling. A significant number of adult writers record words automatically, but incorrectly. A later section of this study addresses error analysis.

70

Automaticity can be said to have two "costs" (Henderson, 1982). The first of these is that the 'debugging' of the automatic process if something goes wrong is very difficult. An example of this is a tennis serve. If one element of the serve is wrong then the whole sequence of actions has to be `unpacked' in order to give attention to those parts of which the server cannot normally afford to be aware.

> "Error detection in the automatic process may also be very poor, and the amazing persistence of speech errors and spelling errors in common words must in part be attributed to the automatic processing from which they result" (Henderson, 1982, p.293).

He feels the second problem is that automatic processing cannot be switched off when it produces an irrelevant or interfering output.

The idea of spelling behaviour occurring on a continuum from effortful to effortless is predicated on the writer having learned or mastered a bank of words or a lexicon from which to draw.

3.5.6 Mental lexicons

> "For every word that a reader can recognize we can say that a memory must exist"
> (Underwood and Batt, 1996, p.38).

Underwood and Batt's (1996) definition of the lexicon as the "sum total of a reader's word memories" indicates that it has been research into reading rather than writing which has predominated to date. Although further work is needed to explore the ways in which writers access and make use of lexical knowledge, existing reading research can offer a basis for hypothesis.

The concept of a mental lexicon has evolved from brain studies and linguistics, (Chomsky and Halle, 1968), and is now widely accepted due to an extensive body of evidence which suggests and supports its existence. We know that it is possible for us to look at a written word, and if it is familiar to us and we have seen it before, we can `find' the representation of the word in our lexicon and discover its meaning and its

pronunciation. In the case of an unusual word we might be able to recognise it as a word, but not know its meaning. The entry in the lexicon would be present, but "associative connections to other words and to event memories are not accessible" (Underwood & Batt, 1996, p.38). If we see a word which we do not know or have not seen before in written form, which could be an invented word, we can apply our knowledge of letter-sound correspondence and pronounce it. If it is a word we have heard orally, we could then access the meaning from the cognitive store, but if it is an invented word or non-word we will not have a meaning listed for it. It is generally held that all speakers of a language have a lexicon which includes meaning and pronunciation, and it has recently been suggested that when a person acquires literacy the lexicon is further developed to include orthographic and visual information (Ehri, 1980, 1984, 1994).

The human brain can perform many of the functions analogous to the use of an actual dictionary: translating between print, speech and meaning, generating words which start with the same letter, producing synonyms, explanations, rhyming words and so on, and the way we can access the words stored in our memories gives some indication of the way in which such lexicons might be indexed and arranged.

The word `lexicon' is now used by psychologists to refer to the way the brain stores information about words and word components. It is conceptualised as consisting of words and word units having several different facets or identities. Each word would have a phonological identity, containing information about the articulatory, acoustic and phonemic properties of the word, a semantic identity or dictionary definition, and a syntactic identity containing its characteristic grammatical function in sentences (Ehri, 1980, 1984, 1994). These elements of the lexicon are common to all speakers of a language, and are thought to be acquired and known implicitly through the development of competence with spoken language. As a consequence of becoming literate another aspect, the orthographic identity or form of the word, is added to the lexicon. Ehri (op. cit.) hypothesises that as the orthographic information is added to the lexicon it is amalgamated not just with phonological information but with

semantic and syntactic information as well, combining to form single representational units in lexical memory.

Our personal lexicon, then, is that part of our memory which stores all our known words, known parts of words, or units of language, plus the meanings we assign to these parts/wholes and our orthographical knowledge, that is, our ability to represent the meanings of these units in writing. The role of the lexicon in relation to reading is generally accepted.

"For normal skilled readers all known real words travel
via the lexical route"
(Underwood and Batt,1996,p.119).

The role of the lexicon in relation to writing is little explored in the literature.

".. there is almost no research on the mechanisms of orthographic word production, and the little that there is has mostly been ignored in discussions of the organisation and processing structure of the lexical system"
(Miceli et al, 1997, p.37).

If the centrality of the lexicon is accepted, a writer might spell by `storing' a word in the lexicon and would access this storage when writing by the sound of the word or by its meaning, perhaps making some use of phonology, semantics, and the word's remembered visual image.

3.5.7 How does the lexicon develop?

Ehri (1984, 1994) sees the lexicon as initially developing to accommodate spoken vocabulary and its related meanings. She proposes that a visual representation system for speech is acquired when children learn to read and spell, and that, as print is established in memory by being mapped onto knowledge of spoken language, acquisition may cause various changes in children's competence with speech.

Perfetti (1991, 1992) advances a theory of lexical development in which the representation of sight words in the lexical memory alters along several dimensions. He suggests that words change from being partially specified to being completely specified alphabetically; from an imprecise

73

form containing unstable letters to a precise form with fixed letters, and from being weakly attached to word pronunciation to being closely bonded to phonemic representations of words. He suggests that the lexicon has two components. The first is a functional lexicon, and the second an autonomous lexicon. To begin with, the beginning reader would have variable and incomplete representations in his lexicon, with only certain graphical elements in certain positions. For example, the word **elephant** may initially be represented by **elt**. A more advanced reader would have a more complete representation, including all of the letters, and both precision and redundancy would increase. The early imprecise and low redundancy representations would be unstable and liable to change. On a word-by-word basis, lexical items move from the functional to the autonomous lexicon (which equates in many ways with automatic word recognition). A similar argument could be made in relation to writing

The development of the lexicon may relate to the way in which memory develops in humans. It would appear that the way memories are stored varies with age. Eidetic memory, for example, is rare in adults but appears to be common in young children. Rose (1992) describes eidetic memory as that which is imaged and timeless. Early in the twentieth century there were many studies done on eidetic imagery and memory, with about 200 published before 1935, and these showed that about half the children studied had eidetic memory, though this fell off and became relatively rare after puberty. So many, if not all, young children would appear to see and remember eidetically, but lose this capacity as they get older. This type of memory might account for the logographic stage of spelling referred to by Frith (1980b). The ability of children to learn words as complete units before they are able to apply grapho-phonemic rules to these might suggest a reliance on visual representation which ties in well with eidetic memory. This might also explain the ability of most young children to learn how to correctly represent their own names in an accurate manner (Treiman, 1993). The fact that such representation is later superseded by the alphabetic approach might tie in with the loss of eidetic memory in later primary years, and this could relate to the changing approaches to spelling which are suggested by Frith (1980), Gough and Juel (1991), and Ehri (1991, 1994).

74

3.5.8 How are words stored in the lexicon and accessed from it?

Although the existence of the lexicon is generally accepted, its organisation is still a matter of great debate. One's views of what the lexicon contains, and how this content might be perceived to be stored will also affect how one believes it is accessed and used, and lexical access plays a central role in successful reading, writing and spelling. Lexicons could be organised in terms of phonology, orthography, frequency or morphology (Underwood and Batt, 1996). They might contain visual images, or a logographic store containing a sequence of letter identities for each word. Abstract morphemic units which express the ideal phonological form of the morpheme might be contained, or the store might define morphemes and some principles by which these might be combined (Seymour, 1992). Semantic and syntactic information might be stored, and the whole corpus of information might be stored by category or with all the information pertaining to a particular word being stored together, as in a dictionary.

If we accept the single lexicon view proposed by Ehri (1980, 1984,1994), all of these sources of information are directly linked. If we accept separate the notion of separate lexicons, each containing a specific aspect of information independently stored, then there would need to be some form of processing to provide the necessary connections. The following sections will consider the research evidence relating to lexical organisation and access.

Phonological representation

As we first learn our language by listening and speaking, it would appear logical to assume that the spoken form of words is somehow represented in the lexicon. As we can conceive and produce speech, and recognise it in a wide variety of styles, the central specification of these articulatory and phonetic patterns must be rather abstract or idealised (Henderson, 1982). If the representation is abstract, then the same representation of word phonology could underlie both the perception and the production of the word.

Speech plays a role in lexical access for many beginning writers. Children certainly vocalise when they write. This is obvious in any infant

75

classroom. Sometimes children have an oral knowledge of the word, but their lexical entry for this is limited to meaning and pronunciation and does not extend to a visual form, whether this is orthographic or morphological.. Sometimes the children, faced with no lexical entry, try to assemble the spelling by trying to represent the phonology of the word. Sometimes they can identify the phoneme they are trying to represent, but have not learned an appropriate phoneme/grapheme correspondence to help them symbolise speech.

Although phonology appears to play an important role for early writers, is it also a feature of skilled writing behaviour? Although beyond the scope of the present study, it is felt that brief mention must be made of evidence from studies of neurologically damaged adults in order to highlight the fact that beginning writers and skilled writers may not access their lexicons in similar ways. Some studies of individuals appear to suggest that phonology is not necessary for lexical access, and that orthographic lexical forms can be accessed for production without the mediating role of phonology via a direct route between semantics and the orthographic lexicon (Shelton & Weinrich, 1997; Rapp et al, 1997; Hanley & McDonnell, 1997). There is, of course, no evidence to suggest that normal and undamaged brains operate in similar ways, and this evidence cannot be taken to question the existence of the phonological route in all spellers. The adults' ability to find alternative strategies when suffering neurological damage might offer support for the inter-relatedness suggested by Ehri's single lexicon model.

Word image

It has been suggested that the lexicon contains some form of visual image. In an early study, Hanna, Hanna, Hodges and Rudorf (1966) programmed a computer with over 300 spelling rules then gave it 17,000 different words to spell. It made errors in over half of these, indicating that the human brain does not rely on rules alone but also takes account of some visual representation and "memory" of spelling. Many writers who are unsure of a word's spelling are able to reduce their uncertainty by writing several versions of the word and looking at these. This implies that a visual

image might be stored, and the writer can check a proposed spelling against a remembered 'template'

Tenney's study (1980) illustrates how orthographic information might be stored in the memory. She examined the belief that the visual memory plays an important role in determining whether spellings are correct or not. She required adult subjects to choose between the correct spelling and a common mis-spelling for a list of words. In her first experiment the alternatives were either written in a normal way so that the subjects could compare how they looked, or in zig-zag writing to distort their appearance. In the second experiment, words were presented orally to the subjects, and they were required either to write down both spellings before making their decision, or to think about these. Tenney hypothesised that accuracy and confidence would be greater in the first experiment, due to the words being available in their visual form. The results indicated that the subjects were able to make a decision based on the normal print, but were hindered and had their confidence reduced when dealing with the zig-zag print, providing further support for the hypothesis that looking at the visual appearance of a word can facilitate spelling decisions.

Morphemic units

Other researchers argue that the mental lexicon contains abstract morphemic units which express the ideal phonological form of the morpheme. Chomsky and Halle (1968), for example, supported this view and claim English has a "near optimal" morphophonemic principle or a near optimal orthography. Support for the lexicon being accessed through morphemes has come from Taft (1991). His work has focused on the recognition of words and pseudowords, so relates to reading rather than writing. He interprets the results of his experiments to conclude that when a reader is trying to locate a word in the lexicon, the word is stripped of any prefix and suffix, and the stem letter string is used for lexical access. If this is the case, the stem of a morphemically complex word would have to be identified before lexical access could occur. A further aspect of Taft's work is that he suggests that the complete morphemic stem may not be necessary, but that the first syllable of the stem enables lexical access.

Whether morphological or orthographic units are stored in the lexicon, and whether part or whole words are contained is still under debate. It has been hypothesised that lexicons may be organised in terms of frequency, and reading research has shown that common or high frequency words result in faster responses than uncommon or low frequency words (e.g. Treisman, 1960; Rubenstein et al, 1970; Forster and Chambers, 1973).

3.5.9 Models of lexical access

Models of reading have increased in sophistication over the years as research has added to our understanding. The separate phonological and lexical routes (already discussed) form the most basic of the models, and more recent attempts to explain how the complex processes of reading and writing may operate will be considered in brief. The following sections will consider dual processing, the logogen model and lexical analogy.

3.5.10 Dual processing model

In terms of reading it has been proposed that the lexicon can be accessed by either the phonological or the direct visual route, with the two operating in parallel. The dual processing route theory proposed that, during reading, words could be recognised by using either of the parallel routes, which basically operate in competition with each other, and depending on which route provides lexical access, different phenomena can be observed. In applying this to writing it could be proposed that two separate processing systems or routes exist to enable spelling production of known and new words in English, and that these operate in parallel. By incorporating both the assembled or phonological route and the lexical route this model is able to account for the fact that grapheme-phoneme correspondences were needed for skilled readers to pronounce unfamiliar letter strings or nonsense words, and for the fact that irregular words needed a specialised storage system. The supporting evidence for the existence of a dual system within reading is based on evidence from neuro-psychology. Where adults have suffered brain damage which has led to loss of ability in spelling (acquired dysgraphia), this has offered researchers the opportunity to study the

78

differences between writing words and writing non-words. Writing words is an index of the lexical process, whereas non-word production is an index of the sub-lexical process (e.g. Shallice, 1981). Such work can show that the two routes are separate neurologically and are independently vulnerable to damage, but cannot help us to determine whether they are functionally independent in normal spellers.

The parallel operating of the two routes in competition (Coltheart et al., 1977) is challenged by recent research on analogy in spelling. If a writer faced with spelling an unknown word is seen to use analogy, this will involve making use of lexical information, such as drawing on prior knowledge of similar words, as well as phonological knowledge in identifying the sound patterns which form the basis of the analogy. The complexity of processing which this would reveal would shed further light on the writing and spelling process.

All known words can be spelled by the lexical route because all words are assumed to be represented in the lexicon. It could, however, be the case that only very familiar words are stored, with less frequently used words being assembled. Words with regular sound/symbol relationships and all new words and non-words must be assembled. This could certainly be argued of English, but is it so in relation to other languages which have more consistent orthographies? Barry (1992) considered whether the dual route model applied to languages with more regular sound-symbol relationships, where assembly would be possible for all words. He looked at Welsh and Italian and concluded that these were not spelled purely non-lexically as there was evidence of lexical priming on non-words, suggesting that just because an orthography allows assembled spellings does not necessarily mean that it requires that process. He concluded that the dual routes of spelling production interact in both deep and shallow orthographies, but this is not necessarily so. His evidence could also relate to analogy and other models.

Research (Campbell, 1987; Goswami, 1994; Marsh et al, 1980) has shown that older children and adults assemble spellings by analogy with known words, or by applying low level phoneme-grapheme correspondences (pronouncing the word, segmenting it and supplying

79

appropriate graphemes to represent each constituent sound). Both of these processes can be applied to non-words as well as to unknown words. Such work shows that there is lexical information affecting the phonological route so the two routes cannot be wholly separate. There must be some connection between the acoustic analysis system and the phonemic buffer which bypasses word recognition and production systems (Ellis, 1984).

The ability of young children to use analogy was demonstrated by Goswami (1988) who found that 6 and 7 year olds were able to spell test words by analogy to clue words, and that they could do this from their stored lexical information rather than needing visual presentation of the words. She concludes that this means that they do not have to rely solely on a process of grapheme-phoneme conversion for spelling new words, but that children can use whole word spelling knowledge to make such predictions. This could be due to retrieval from the lexicon of whole words, or via the retrieval of known orthographic sequences of letters as units for spelling common sounds in words. Goswami suggests the latter is the more feasible explanation as all the words used in the experiment were new to the children. However, ensuring that test words are 'new' is very difficult, and there must be some possibility that these were known, or partially known, by the children. Were this the case, the children could have been using lexical knowledge rather than analogy. The use of infrequently used words might have avoided this confusion.

Further support for the view that analogy may use orthographic patterns rather than whole words comes from studies of reading which indicate that some subjects use generalised orthographic patterns to read non-words. This would indicate that the reader has the spellings of several words stored in the lexicon which are organised by pattern (Ehri, 1994). Glushko (1979, 1981) offers an activation-synthesis model to show how this process works:

> "As letters in a word are identified, an entire neighbourhood of words that share orthographic features is activated in memory, and the pronunciation emerges through the co-ordination and synthesis of many partially activated phonological representations"

(Glushko, 1981, p.62).

3.5.11 The logogen model

The term logogen can refer to what some see as "a sort of British dialect word for lexicon" (Henderson, 1982, p 318), but is in fact a model in its own right, proposed by Morton (e.g. 1980). Morton uses the word logogen to refer to a word-specific memory. His logogen model of word recognition, which built upon Treisman's (1960) attenuation theory, proposes that the internal lexicon is composed of logogens, which are word detectors or collectors of printed evidence. The brain gathers evidence from sight and hearing, and the different features of the input prompt mental activity. Each logogen has a threshold for firing and, when the detectors have enough information and evidence, the threshold is eventually reached and recognition occurs. When the reader looks at a word, several logogens may be activated. This is likely to be the case when the target word has several close orthographic neighbours. For example, the word **band** might activate the logogens for the words **bard bend bind bane** and **bang**, all of which differ from it by one letter, but only the logogen for the word **band** will gather sufficient information for it to reach its threshold for firing. The threshold for firing is set by the word's frequency, so **band** would be easier to recognise than **bard**, which is used less commonly.

A word's threshold is set by the number of times it has been encountered. Thus high frequency words are more readily recognised than less commonly used words. In addition to a sensory input, Morton suggested that a cognitive system could also provide information about meanings associated with the words.

However, a reader's ability to decode and pronounce non-words shows the inadequacies of this model. An illegal letter string would not activate a logogen sufficiently for firing, yet the reader is able to decide quickly and easily that certain forms are non-words.

The use of non-words in studies of writing acquisition or language use may limit the subjects significantly if one accepts that the meaning of the word is 'stored' along with its graphical representation. As this

81

researcher views spelling as a cognitive process, those studies relying on non-words are not enabling the subject full access to normal processing routes. The results of such studies need careful interpretation.

The fact that readers face more difficulty in determining the legality of those letter strings or non-words which closely resemble actual words, causing a slight time delay in reader response, has been explained by supporters of the logogen model. The closer a non-word is to a legal word, the more logogens are likely to be activated, and it could be that this postpones the decision until all possibilities are considered, creating an extended deadline (Underwood and Batt, 1996).

Morton's view of the location of meaning differs from those who accept the idea of lexicons. He states

> ".. in contrast with most lexicons I do not see all the information relevant to a particular word as located in the same 'place' and accessed simultaneously. 'Meaning' is something to be computed as necessary, and not looked up in a unit"
> (Morton, 1980, p.120).

Morton's (1980) article considered the application of this later logogen model to writing. His examination of the case study of Gail demonstrated that his proposed model could not adequately account for Gail's writing performance. Gail wrote words which were incomplete, and which she knew were incomplete. Morton's graphemic output system is supposed to produce a string of letters processed from one end to the other. Gail's writing included elements of the string, but she left gaps where she knew she had omitted letters. Morton considers that this could be explained by the existence of a pictorial record of the word in the lexical entry, but admits that his model cannot accommodate this explanation as it contains no real concept of lexical entry. He alternatively proposes that graphemic output is somehow screened by some visual system, but again admits his model does not include such links. Morton's logogen model thus presented would also fail to explain the facility some individuals have with crossword completion, being able to use a skeletal framework of a word plus an

82

associated clue as a stimulus for searching some visual store of words which would fit the given pattern.

This admission by Morton (1980) that the logogen model could not fully account for the results of the case study leads us to search for a more acceptable model of lexical processing.

3.5.12 How are words or word parts organised within the lexicon?

The complexity of the lexicon is not fully understood, but the many different tasks which the brain can perform in relation to words provides some indication of its organisation. Alphabetical order must play a part, as must frequency, word shape, phonology, and morphology. Whether the lexicon need a separate entry for words such as **line, lines, lined** and **linear** is not clear. How would related words such as **underlined** and **outlines** be stored? Would **delineated** be associated with **line**? What about **align**, which has the same root but which has undergone a spelling change? What about compound words such as **linesman**? **Line** is a single morpheme word, whereas the others have additional morphemes. Such words either each have a separate entry or they may be stored as variants of a single morphemic entry (Underwood and Batt, 1996). This latter suggestion sounds feasible, but it may be that such links have to be made by the individual. It could be that skilled spellers have created such complex links between words sharing morphemic features, but that this is an advanced stage of lexical organisation. This could be facilitated by word study or by direct teaching and might not happen automatically to all learners. This could relate to recent suggestions that morphemic study can help spelling by reducing uncertainty, such as learning the connection between **malign** and **malignant.** Pronunciation and the knowledge that the two words are connected can help the speller represent the silent letter in **malign.** More work is needed so that teachers might support the learning of reading and writing in directly meaningful ways.

3.5.13 Lexical access for reading and writing

The differences between lexical access for reading and for writing has not been fully explored, and for beginning readers and writers it is

unclear whether there are separate lexicons for reading and for writing, or whether the differences relate to the ways in which the lexicon is accessed. It is certainly the case that some children can read words they cannot spell, and some can spell words they do not recognise in their reading (Frith, 1980; Burden, 1992). One experiment with 48 first to third graders examined how well children could read words printed in their own invented spellings in comparison with how well they could read the same words spelled correctly. Subjects responded similarly to the two versions of the words, with a small tendency to respond more accurately to the standard version across the grade levels (Gill, 1989). This would seem to indicate that word recognition and spelling are closely related processes, but that several versions of a spelling may be stored in the lexicon. Alternatively, it may support Perfetti's model of lexical development (1991,1992).

3.5.14 Summary

The lexical store, then, can be seen as a store of associations between orthographic and phonological patterns corresponding to familiar words, and the phonological or sub-lexical as the analytical correspondence between orthographic and phonological units of miscellaneous sizes. Without lexical access there are many English words which we would not be able to spell accurately. Although phonetically regular words could be assembled via a phonological route, this would not be successful with irregular spellings, or with words such as homophones and homonyms.

However, the lexical route alone cannot account for spelling of non-words as these will not have been seen before and cannot have been committed to the lexicon. Our ability to represent nonsense words, particularly words which we have never seen before, demonstrates that we can apply existing knowledge to new situations, and that we do not rely exclusively on known visual patterns. If writers were to use the visual strategy alone, they would not be able to use words with ease unless these words were within their sight vocabulary, that is, they had encountered these words in written form and had committed the correct letter order of that visual form to memory. Words which had not been encountered could not be represented easily, and our ability to write nonsense words to

84

dictation shows that the lexical route alone is not sufficient to account for the spelling process.

Neither the phonological nor the lexical route can, in isolation, offer an acceptable model for spelling. Further developments, including the dual processing and the logogen model, also offer incomplete explanations. Ehri's model of the lexicon is able to incorporate both the lexical and the sub-lexical and at the present time this appears to offer the most likely explanation of how the brain processes print.

3.5.15 Conclusion

In summary, skilled spellers appear able to retrieve the spelling of familiar words as wholes from a graphemic word production system. A word is addressed by a combination of morphemic and semantic specification. Writers can also use analogy and/or phoneme-grapheme correspondence to help them assemble a plausible spelling for an unknown word. People seem to vary in the extent to which they rely on addressed or assembled spellings, and it is a possibility that this reliance can vary within any individual depending on the word.

The spellings of young children in the present study will be examined for evidence of retrieval or assembly, and a spelling test will be used to compare children's spellings of regular and irregular words.

PART C: THE LEARNING AND TEACHING OF WRITING AND SPELLING

This section includes an overview of studies of children learning to spell (3.6) and a consideration of classroom practice and pedagogy (3.7).

3.6 Studies of children learning to spell

3.6.1 Studies of children learning to spell: an Introduction

Beginning spellers differ from experienced spellers in many ways. Not only does each element of the writing task vie for attention and require great effort for the novice writer, but it is also the case that the processing requirements for beginners and skilled spellers must differ substantially, as beginners have a limited range of strategies on which to draw. Children have not acquired the lexicon to which adults have access, so have to rely on non-orthographic memory mechanisms (Goulandris, 1992; Funnell, 1992). Children may also differ considerably from each other. This section will consider some of the pertinent research which has focused on young spellers and their behaviours.

Studies into children's spelling prior to the 1970s tended to focus on the identification of those words which were most important in children's writing, and the development of lists of words to be learned and taught. This emphasis illustrated the general belief that spelling was learned by memorisation of the correct letter order within words, and the use of word lists was central to the teaching of spelling. Only with the shift in emphasis since the 1970s towards a closer examination of children's actions when writing has our understanding of the writing process begun to develop. This was underpinned by the acceptance that children's non-standard spellings could be seen as 'invented' spellings, which are influenced by interactions among children's current word knowledge, their ability to generalise regularities, and the frequency of observed spellings (J. Gill, 1989; C.T. Gill, 1992).

3.6.2 Read

Read pioneered the view that the invented spellings of young writers are systematic, rule-governed and consistent, and that the misspellings of young children reflect a developing sense of the phonemic properties of words. His studies led him to conclude that children begin to write by using their knowledge of spoken language and their developing

knowledge of sound/symbol relationships to represent spellings, relying on phonological information.

The work of Read (1971, 1983, 1986) stimulated a great deal of interest and further study in spelling, focused on children's application of the grapho-phonemic relationships rather than memorisation. His work established that the errors of young children might be subject to analysis and explanation in the same way that reading miscues (Goodman, 1967) can throw light on the process of reading. This type of approach is "treating spelling performance as one window on the development of language and cognition" (Read, 1986, p.viii).

Read (1971) analysed cases of children who had taught themselves some kind of spelling and suggested that each was based on a phonetic principle, with the letter name playing a key role in phoneme-letter correspondence. He concluded that these children's invented spellings were all based on roughly the same system, that children were able to apply rules to spelling, although not always the conventional rules, and that children were able to distinguish letter names from the sounds they represent, using a letter to represent only a segment of its name eg DA (day). He expressed the view that children acquire orthographic knowledge systematically, not randomly.

Although Read's work has been seminal, his research is not without its critics. Gibson & Levin (1975) considered that the creative spelling he observed was rather an unusual accomplishment and suggested that the children in his study were not "run-of-the mill" children. Certainly it is true that children who have devised their own spelling systems without formal education are relatively rare, and this must question whether Read's conclusions can be applicable to the general population. His studies were based on thirty two children, eleven of whom created 87% of the data, and four children contributed more than 50%. The initial two children who prompted the study were the children of professors, and the rest of the children were attending local kindergartens and nurseries, mainly Montessori. The sample was, Read admits, not systematic and was biased towards "children of upper-middle-class professional families" (Read, 1986, p.35).

Read's views can be summarised as follows,

"In summary, then, phoneme-by-phoneme encoding is the major spelling strategy in both the primary and the early elementary years, but after the first or second grade, the phonetic representations found in creative spelling give way to a reliance on frequent correspondences in standard spelling"
(Read, 1986, p.122).

This work led to the view that children may initially develop a phonically mediated strategy for spelling, but the belief that young children habitually spell via sound is held by some to be an over-simplification (e.g. Ellis, 1984).

3.6.3 Bissex

Bissex (1980) conducted a detailed study of one child by outlining the stages of spelling development which her son, Paul, went through. She noted that as he moved from the sound transcription approach of invented spelling towards standard spelling Paul not only conventionalised his sound-letter relationships but also showed an increasing awareness of the complexity and indirectness of sound-spelling patterns. More spellings became automatic, word parts became familiar, and his strategies involved using letter groups rather than letter-by-letter construction. While he still used letter-sound relationships, this was subordinated to visual (recall) and semantic (morphemic) strategies. These were what Bissex referred to as new branches in his continued growth in spelling.

"Children begin reading and spelling with oversimplified or incomplete notions of what each involves."
"Progress towards standard spelling, as Read and others have shown, is made through changes in children's categorizations. As children take into account more kinds of information, their reading and spelling become more accurate"   (Bissex, 1980, p.194).

Bissex's study was later analysed by Gentry (1982) as part of his research.

3.6.4 The Virginia School: Gentry

The innovative nature of the work done by Read in the 1970s led to others attempting to apply his findings to larger groups of children within the school setting. The researchers working with Edmund Henderson at the University of Virginia's McGuffey Reading Center began to examine the spelling of elementary school children, and this work has since spread. Their findings are published by various researchers (Beers et al, 1977; Gentry, 1981, 1982, 1991; Henderson & Beers, 1980; Henderson, 1985) and the work emanating from Virginia has been deemed the "largest single body of work on creative spelling in school" (Read, 1986, p.51). Based on their findings they proposed a theory of spelling development and claim to have identified stages in the development of spelling ability through which children pass. The Virginia researchers argue that children

".... progress through five levels of spelling, with each representing a different conceptualisation of English orthography"
(Gentry, 1982, p.193).

The descriptions of these levels vary slightly from study to study, but the work of Gentry will be taken as the main exemplar of the Virginia school.

On the basis of work by Read (1971), Bissex (1980), Clay (1975) and his colleagues Henderson and Beers (1980), Gentry (1977, 1978, 1981, 1982, 1991) claimed that the developmental stages "discovered" in children's early writing and spelling by himself and fellow researchers supported the existence of a sequence of development through which children progress. These stages were variously defined as:

precommunicative/deviant

semiphonetic/pre-phonetic

phonetic

transitional and

correct (Gentry, 1982).

The precommunicative stage was defined as involving marks on the page which can be scribble or letter-like forms or a mixture of letters and numbers. No attempt to represent sounds is evident. The semi-phonetic stage is when children begin to use letters corresponding to the sounds they can identify at the beginning and possibly the end of words or syllables, for example **RUDF** to represent "are you deaf". At the phonetic stage Gentry suggests that children can represent all the phonemes in a word by letters/graphemes, and in the transitional stage children begin to assimilate the conventional alternatives for representing sounds, such as the use of -**igh** or -**ck**. The correct stage involves the firmly established knowledge of the English orthographic system and its rules.

Gentry thus supported Read's (1971) view that children begin by making use of phonology, with their early spellings being prephonetic or phonetic.

The impact of the Virginia researchers on teachers' attitudes to, and understanding of, spelling has been considerable. The notion of developmental stages has become widely accepted, and has been regularly communicated as fact to teachers and parents. The pamphlet "Helping children with spelling," one of the Parent Teacher Guides series from the University of Reading written by Redfern and sponsored by W.H.Smith's, contains the following statement

> "Just as it takes a few years to develop fluent speech, children need time to develop spelling competence. They normally pass through five stages on their way to becoming conventional spellers and should be allowed to progress through these stages without undue pressure"
> (Redfern, undated).

and

> "Thanks to the work of Gentry (1987) we now know that spelling is a developmental process and children are likely to pass through five stages on their way to becoming accurate, conventional spellers"
> (Redfern, 1993, p.6).

Although the influence of Gentry and his colleagues has been widespread, there are several aspects of this body of research which deserve critical consideration. Gentry's work focused not on children's free writing but on their ability to represent `unknown words'. His research design excluded all words which the children in the sample may have encountered or been taught, thereby making his a "pre-automaticity" study in that no use of memory could be made. Children had to rely on their ability to assemble spellings or to spell by analogy with known words. In classifying this range of spelling attempts, Gentry provides a useful insight into children's assembly strategies, but his model cannot be used in a wider sense to describe "normal" spelling development due to its exclusion of known words. In relation to earlier discussion of lexicons, Gentry's work is focused on the sub-lexical route.

Gentry's research sources consisted of small studies, with samples which were not necessarily representative. One study (1982) allocated levels of spelling development to the writing of Bissex's son, Paul, (Bissex, 1980) and his Ph.D. study focused on pre-automaticity (words unknown by the children) so did not really look at spelling ability in its broadest sense. Its main contribution is to our understanding of word assembly.

Other researchers in the Virginia school adopted slightly different descriptions for the various stages of development they identified, and some of the later work expanded Gentry's stages to include scribble, pre-phonemic, early phonemic, letter name, transitional, derivational, and conventional stages (e.g. Henderson & Templeton, 1991). Despite the changes in terminology, the overall view of learning to spell remained the same. A significant conclusion of such studies was that children start to spell by representing the sounds of letters, and do not remember letter strings or use visual memory until the transitional and correct stages. Later writing, such as Gentry, 1991, does acknowledge that the developmental stages do not explain all spelling behaviour and notes the role of memory.

"These spelling patterns occur naturally along with rote memorized spellings in young children's compositions" (Gentry, 1991).

3.6.5 Frith

Frith's (1980, 1985) model was concerned with the interrelationship between the development of reading and writing, and suggested that this interaction helped the learner towards increased proficiency in each. This model included reference to spelling development. Frith identified six stages in learning to spell, although she did not give detailed definitions of the proposed stages. The stages were;

    1a symbolic,

    1b logographic

    2a alphabetic

    2b orthographic

    3a alphabetic

    3b orthographic.

Frith's symbolic preliteracy phase is similar to the precommunicative stage identified by Gentry, but she holds that the next stage is a logographic stage, which relates to whole word recognition in reading and to the production of complete isolated words in writing. Some visual representation of the written word becomes stored in the child's mental lexicon as a logograph or pictorial representation, and the child's own name would be one example. Frith would argue that spelling development in this stage lags behind reading, as logographic representations become available for spelling only some time after they have become available for reading.

The later alphabetic strategy is non-lexical, involving phoneme-grapheme associations. English is substantially alphabetic, and in principle any word can be spelt (although not always correctly) by learning the relationship between the phonemes and graphemes. Frith sees the child acquiring the relationship between phonemes and graphemes and using it first for spelling and then for reading. Often the child might be reading

logographically but writing alphabetically, as has been demonstrated in the research of Bryant and Bradley (1983, 1985).

The final orthographic stage reflects an understanding of the spelling system and the production of abstract letter arrays corresponding to morphemes. During this non-phonological stage the child acquires spelling rules or patterns due to increasing experiences with the orthography. Irregular spellings also become accurately represented. Again progress in spelling is behind that in reading, with the child's orthographic skills more advanced in reading than in writing.

Some researchers question whether Frith's logographic stage exists at all in spelling, suggesting that the alphabetic approach may be present from the start (Goswami and Bryant, 1990; Bryant and Bradley, 1983, 1985). Justification for the logographic stage can be derived from the words written correctly by children before they are considered to have the necessary graphemic/ phonemic proficiency to assemble these, or in writing words which are irregular in their spelling. Although Read's main argument is that early spelling is created rather than retrieved, he does quote some instances of conventional spelling which he considers have been retrieved (1981, p.110), and which may support the existence of the logographic phase. Similarly, Gentry's acknowledgement that some words had been rote-memorized also supports this (Gentry, 1991).

An experiment conducted by Gough, Juel and Griffith (1992) taught four and five year olds to read four words printed on cards. One of the words had a thumbprint next to it, and the children quickly learned to read the thumbprint word. When the thumbprint alone was shown, most children said the word, and when the thumbprint was removed, children did not recognise the word. This would seem to support the evidence of logographic recognition of words, where children identify salient features to help them remember and identify words, although these features may not always be conventional letters, but it does not necessarily support the existence of this as a distinct phase of development.

Seymour (1992) argues that we might infer the presence of a logographic phase in spelling if complete or partial word knowledge was demonstrated in the absence of alphabetic capability. He found that all

93

children in their first year of school could write their name before they were able to write the letters in response to dictated sounds. Byrne's (1992) work would also seem to support the fact that children rely on visual cues before they are able to make use of phonological information. His work involved teaching preliterate pre-schoolers to read two words which had only their first letter to distinguish them, for example, **fat** and **bat**. He then showed the children new words which shared the same initial letter as the taught words, and asked them about the new words. For example, he might use **fun** and **bun**, and ask the children "Is this **fun** or **bun?**", or adopt a similar approach with words such as **fall** and **ball**, or **fin** and **bin**. As the results showed that the children's responses were no better than chance, he concluded that they had not been able to deduce the relationship between initial letter and initial sound. Byrne did further work in this area and found that none of the following approaches had any effect on improving children's analysis: teaching the letter/sound associations along with the word, teaching four words rather than two, making the initial sound easier to distinguish, using shapes rather than letters, or holding the initial sound constant and varying the stem. What he did find, however, was that children could successfully apply analysis when presented with meaningful units. He used the words `clean chair, **dirty chair'** and found that children could identify the first symbol and transfer this knowledge to the items `**clean plate, dirty plate'**.

Goswami and Bryant (1990) feel that Frith's stages do not allow for the stage of development which may exist between whole word and phonemes, that of sub-syllabic units such as onset and rime. They also point out that there is no published normative data on children's ability to spell words from visual memory prior to using a phonemic strategy to spell and

> "... a great deal of the development takes the form of children just getting gradually better at strategies which they use right from the start"
> (Goswami & Bryant, 1990, p.147).

This does not mean, however, that visual memory is not used, but that research needs to explore this strategy further.

3.6.6 Gough and Juel's cipher theory

The idea that children master their first words by paired-associate learning, not through repetition and drill but by associating an arbitrary response with an arbitrary stimulus has been put forward to explain how young children learn to read and spell (Gough and Juel, 1991). Through this selective association the learner examines the stimulus and selects from it some cue, aspect or property which enables it to be distinguished. Whatever the cue, the learner associates this with the word, and when he next sees the word, he retrieves the associated response. If correct, he retains that association. If not, he discards it and selects another cue.

Gough and Juel feel that this explains why children can recognise visually distinctive rather than short words. It also helps to explain why children can learn dissimilar words more easily than similar words, but also why they make more over-generalisation errors, for example, confusing dog with dinosaur. In the unpublished study referred to in an earlier section, Gough found that all children learnt the word which was on a card containing a thumbprint more quickly than the other three words. However, when the same word was presented without the thumbprint, few could identify it. The child may learn to recognise a word by using an extraneous cue, sometimes ignoring the word itself. Most words do not have such cues, however, so as a system it can provide a start, but could not support the learning of an extensive vocabulary.

If children know the sounds of the language, and if they have the means of converting print to sounds, that is, knowing the letter-sound correspondences of the language or its orthographic cipher, they could recognise words (Gough and Juel, 1991). Rather than seeing this as a set of rules (phonics), these researchers consider that it could equally well consist of an analogical mechanism.

> "The nature of the cipher is a fascinating theoretical question. We do not know what it is, but we do know

95

how to measure it: the child's mastery of the cipher is directly reflected in his ability to pronounce pseudowords"
(Gough and Juel, 1991, p.51).

They argue that the cipher is not taught but discovered, through what they call cryptanalysis. To perform cryptanalysis the child needs four things:

i)   cryptanalytic intent; s/he must grasp that there is a system of correspondences to be mastered

ii)   s/he must develop an awareness of the letters that figure in these correspondences - registering every letter

iii)   s/he must realise that each spoken word can be decomposed into phonemes

iv)   s/he must be aware that printed words can be paired with their spoken equivalents.

The first three of these stages combined together equate with the alphabetic principle. Gough and Juel's research, as others, suggests that phonemic awareness is the key to the transition. It is necessary but not sufficient; it unlocks the door but does not open it. Until the child has mastered the cipher he will have to rely on selective association in his reading, and only when the child has mastered the cipher can he read words in a new way. This will make the child rely more heavily on word familiarity than cipher readers do. Gough and Juel also state that the children who have and have not got the cipher correctly will spell in different ways. A selective reader trying to spell **camel** may remember that s/he associated this with humps - and recall the **m**, but nothing else. S/he may add other letters around it (eg **bimot**) - so the spelling error may bear little resemblance (and only accidental phonetic resemblance) to the target word. S/he may, though, have all the symbols in memory, so may spell correctly. Any errors, however, will tend to be non-phonetic.

"If a child does not know the cipher, his spelling must derive from something other than the phonological form of the word. Correct letters might come from selective association, or they might come from his visual memory. But incorrect letters must be randomly derived"
(Gough and Juel, 1991, p.54).

A child who has mastered the cipher may spell **camel** as **kaml.**

Research by Cataldo and Ellis (1990) also highlighted similar difficulties. They describe a child who was able to correctly segment 68% of the initial consonant phonemes in a test, but who could not represent these on paper. Similar occurrences were observed during the present study by this researcher.

> "..some children who produce precommunicative spellings may possess the necessary segmentation ability but their spelling efforts are blocked by their ignorance of letter-sound associations (Cataldo and Ellis, 1990, p.113).

Gough and Juel hypothesised that given a misspelled word, the proportion of its letters that are intrusions (i.e. not in target word) would decrease with the child's knowledge of the cipher, and they found a significant negative correlation of the proportion of intrusions with scores on the Bryant Test of Decoding.

The design of some research studies does not assist their contribution to this debate. Huxford, Terrell and Bradley's (1992) longitudinal study concluded that children did use a phonological strategy for spelling before reading, but as they only used dictated words and did not consider spontaneous writing this study did not necessarily draw on words which had already been committed to, and stored in, the children's lexicons. They detected a delay between the onset of an ability to "invent" spellings and the ability to decode, sometimes of many months. Thus it may be concluded that a child who can spell phonologically may be able to decode, but a child who cannot spell will not be able to decode. Children who invent spellings are practising the ability to analyse words phonologically.

Work by Suk-Han Ho and Bryant (1997), on the other hand, shows support for the cipher stage. Their work on children reading Chinese shows that, beyond the logographic stage, children make use of the phonetic components of characters, even in a language that is not alphabetic.

"These findings suggest that the script-sound regularities in Chinese, although they appear not to be very regular, do help children learn to read Chinese" (Suk-Han Ho and Bryant, 1997, p.287).

3.6.7 Ehri

Ehri (1994) disagrees with Gough's two-stage model, suggesting an intermediary stage called phonetic cue reading where several cues are selected and associated with the word, but these cues are letters that link the spelling to the pronunciation of the word. This is like a primitive form of deciphering because the associations are phonetic, but they are only partially related to the word in question. Ehri tested Gough's assumptions by setting up an experiment with kindergartners in three groups according to their word reading ability. The first group consisted of pre-readers who could read 0-1 beginning level words on a list of 40 words, the second were novices who could read 1-11 words and the third group veterans who could read 11-36. The first two groups were taught to read two kinds of word spellings. One set consisted of simplified phonetic spelling of words. All the letters corresponded to sounds found in the names of the letters, for example, **JRF** spelled **giraffe**. The other set consisted of visually distinctive spellings, created by varying the height and ascending or descending position of letters to give each word a unique contour. Each word also had unique letters not appearing in other words, but none of the letters in visual spellings corresponded to the sounds in words, for example, **WBc** spelt **giraffe**. Ehri reasoned that if Gough were right, the novice readers would find it easier to learn to read words with distinctive visual cues than words having phonetic cues, whereas if she were right, they should learn the phonetic spellings more easily than the visual spellings. She found that the novices learned to read the phonetic spellings significantly faster than the visual spellings, supporting her own view. The pre-readers found visual cues significantly easier to use, suggesting that Gough's portrayal of visual cue readers may apply more to non-readers than to novice beginning readers. Overall the findings of this study supported Ehri's claim that there is another way to read words besides memorizing visual features and besides

decoding letters into sound. The processing of a few salient features and committing these to memory was demonstrated by the group she termed "phonetic cue readers". As visual cues are harder to remember than phonetic associations she suggested that poor readers may rely on phonetic cues in their reading.

Ehri, working with a number of colleagues, has conducted several studies exploring how children learn to spell, and in particular how words become stored in memory (e.g. Ehri, 1980, 1984). The theory which has evolved from these studies is that spellings of words are stored by combining their orthographic identities with the other identities already stored in memory. These include the phonological identity, which she considers the most important, and also the syntactic and the semantic (Ehri and Roberts, 1979; Ehri and Wilce, 1980). Ehri holds that this amalgamation between the spelling of a word and its phonological identity occurs when a reader can analyse how the individual letters symbolize the phonemic constituents in pronunciation (Ehri, 1984). In order to be able to do this the reader must know which phoneme each letter(s) typically symbolize, and must be able to segment pronunciation into phonemes in order to match grapheme and phoneme.

Later work by Ehri (1995) has led her to the conclusion that at the heart of sight word learning is a connection-forming process, with information then stored in the lexicon. Ehri sees word learning as starting with a non-alphabetic process (equivalent to Frith's logographic stage) which she terms pre-alphabetic. This is followed, when learners acquire some knowledge of the alphabetic writing system, by two alphabetic phases. Initially the partial alphabetic phase involves partial connections "linking the most salient letters to sounds" (1995, p.117), with complete connections leading to the full alphabetic phase. Finally the consolidated alphabetic phase, which equates with Frith's orthographic stage.

> "Alphabetic connections linking all of the letters in spellings to their pronunciations enable mature readers to represent thousands of words uniquely in their mental lexicons and to locate the pronunciations

and meanings of these words accurately and automatically upon seeing them in print"
(Ehri, 1995, p.117).

In relation to reading, Ehri is thus able to account for all sight words, that is, those which have been read several times. For words not known by sight she sees three methods operating: decoding or phonological recoding, reading by analogy, and reading by predicting, using the context and initial letter, or both. She concludes that "Print maps speech systematically at both the lexical and the phonetic levels" (Ehri, 1984, p.120), and believes that words and letters are the primary units of the visual representational system stored in memory.

3.6.8 The debate about developmental stages

The existence of developmental stages is supported by researchers (Beers and Henderson, 1977; Henderson and Beers, 1980; Henderson, 1982, 1985; Gentry, 1978; Temple, Nathan and Burris, 1981). Ferreiro and Teberosky (1983) identified five stages which related to the orthographic development of Spanish speaking children, but the existence of clearly defined stages of development in spelling is not fully endorsed within the research community. Researchers such as Clay (1975) and Harste, Woodward and Burke (1984) could not identify any developmental sequence in the way literacy emerges from the data they collected.

"If there is an acquisition sequence which can be described for all children I have not been able to discover it in these examples"
(Clay, 1975, p.19).

"I doubt whether there is a fixed sequence of learning through which all children must pass"
(Clay, 1975, p.7).

Like Clay, Harste believes that differences might be due to experiences.

"The key to understanding language learning is experience - not age, stage, or Piaget"
(Harste, 1994, p.1221).

100

Clay's sample were the same age as in the present study, four to seven, and her conclusions are derived from the evidence provided by the children rather than on laboratory type experiments. Such observation of actual behaviour should offer a broader picture of children's performance than some narrowly defined experiments.

Goswami and Bryant (1990) also question whether stages of development exist, and Bryant and Bradley (1983, 1985) do not subscribe to the idea of stages of development, though they agree that reading and spelling are closely connected and mutually influential. They speculate that reading and spelling begin on different paths (reading is visual, spelling is phonological) and only after a time become connected in the child's mind, after which the child begins to use 'global' methods for spelling and phonological methods for reading. They see phonological awareness as the key.

Sulzby's (1985) study in which children were invited to write stories and were given a specific topic led her to conclude that the writing systems she observed were "part of a many-featured repertoire" rather than a strictly developmental sequence.

The use of classification systems to describe performance would indicate that there is one route to learning which all children take. This is an attempt to simplify and make sense of a very complex process, but such oversimplification is not useful if it misinforms professionals engaged in obtaining the best results from children.

3.6.9 Do individuals adopt different approaches?

It may be the case that rather than a series of developmental stages, individual children may be making different use of a number of strategies. It is an obvious fact that individuals, both children and adults, differ in their ability to spell, with both the rate of accuracy and the range of errors causing inter-individual variation. Are such differences caused by innate ability or aptitude, or are they caused, or at least affected, by teaching methods in schools? Do all children learn to spell in the same way?

It would appear that individuals vary greatly in their spelling strategies, regardless of age differences. Baron et al (1980) identified a group good at spelling by letter sound rules and classified these as "Phoenicians", and another group who made many mistakes with such rules as "Chinese". In an experiment which considered whether adults differed in their ability to use sound spelling rules they discovered that the "Chinese" have a subtle deficit in analysing phoneme segments in speech, and apparently rely on whole-word recognition as if dealing with logographic symbols. "Phoenicians" errors were more likely to follow rule patterns whereas the "Chinese" tended to make errors in spelling phonologically illegal nonsense words.

A study to examine whether the Phoenician/Chinese distinction applied to spelling was conducted by Sloboda (1980). His work was with sixty literate adults who were presented with two alternative spellings of a word and asked to identify which was correct. In some instances the alternatives were phonologically similar, and others were phonologically dissimilar. Most of the errors resulted from phonologically similar conditions, and most mistakes were not due to the visual similarity of the alternatives. He further examined the data to examine differences between subjects, and concluded that a phonologically based word identification system is "at the very least, preferred to a visual route" (p.237). His conclusion supports the view that individual differences exist in relation to spelling strategy.

> "There is no evidence from these data that there are discrete subject groups. It appears rather that there is a continuum of strategies from these who are hardly influenced by phonology to those who are highly influenced by it"
> (Sloboda, 1980, p.238).

Sloboda was interested in examining whether good spellers have direct access to some sort of visual memory, perhaps as visual imagery, which contributes to their success in spelling. Further experiments led him to conclude that there are individual differences in the use of visual imagery in spelling, but that these differences do not relate directly to spelling ability. Some good spellers are able to image what they want to spell, and so are

102

some poor spellers. He presumes that poor spellers visualise incorrect versions of the spelling in question. The fact that some good spellers do not use visual imagery suggests that this may be one of several strategies available to individuals. He concludes with the hypothesis

> "..that good spellers achieve their results, not by virtue of particular skills like imagery or application of linguistic rules, but by virtue of their memory for the way individual words are spelled. One might say that whilst average spellers spell by rule, good spellers spell by rote"
> (Sloboda, 1980, p.247).

Some children may rely more than others on rote, or retrieval from memory. Dodd (1980) found that deaf children do not make phonic errors but appear to use retrieval. They therefore do not perform better with regular than with non-regular spellings, as hearing children do.

Although there is a positive correlation between reading and spelling performance in general, there are good readers who struggle with spelling, and poor readers whose spelling is better than average. Good and poor readers have been shown to differ in the strategies they use for spelling (Barron, 1980). In his experiment with 11 and 12 year old, poor readers relied on a phonological strategy when spelling, with better readers using a visual-orthographic as well as a phonological one (even taking account of word familiarity). He concluded that this is not due to the adequacy of the lexical information itself, but to the different ways in which good and poor readers make use of the visual-orthographic lexical information.

Frith (1980) queried whether those poor spellers who are good readers make different kinds of errors from those poor spellers who are also poor readers. In a study of twelve-year-old children she identified three groups. Group A consisted of good readers and good spellers. The children in the second group, Group B, were good readers and poor spellers, whilst those in Group C were poor readers and poor spellers. All were tested on real and nonsense words. Frith found that the children in Group B did make different kinds of spelling error than other poor spellers. Their errors were consistently phonetic. Although they have a sound grasp of sound-to-letter rules, when faced with plausible phonetic alternatives they cannot reliably

103

select the correct option for a given word. The mis-spellings of Group C, who faced difficulties in both their reading and spelling, were inconsistent and not phonetic. They appeared to have difficulties at an earlier stage of the spelling process than Group B.

Whilst, as Uta Frith (1980) suggests, spelling in alphabetic scripts essentially means representing speech sounds and so can be described as visible phonology, spelling also reflects other levels of language. In a study of the spelling behaviour of 100 boys aged 7-11 years, Turner and Quinn (1986) found that the younger children tended to rely on auditory information for the spelling, irrespective of the nature of the word, whereas the older children produced better results by using more visual information. This move from the mere encoding of speech to a greater use of visual strategies was also noted by Marsh, Friedman, Welch and Desberg (1980) who suggest that these visual strategies take over from sound-to-letter decoding from the age of ten onwards, as the child gradually moves towards spelling by analogy to known words. They suggest that it takes a number of years of experience with reading and spelling to build up a visual store sufficient to support such a strategy.

Other researchers suggest that the capacity to grasp the alphabetic principle and apply it uniformly is preceded by the slow development of various "conceptual substages" which are not yet organised into a development sequence (Sinclair and Berthoud-Papandropoulou, 1984). Phonological analysis, establishing stable phoneme-grapheme correspondences, and the ability to phonologically encode "appear to be characteristics of covert knowledge in a broad sense, rather than a particular skill acquired through association and practice" (Sinclair and Berthoud-Papandropoulou, op cit, p.89).

Rieben, Meyer and Perregaux (1991) considered how the representations within lexicons might be constructed and modified as children learn more about the written language. They queried whether there are different ways of reaching this representation. Their study of five six-year-olds led them to conclude

> "..our findings suggest that some of the differences
> observed in the children's use of the various strategies
> must be attributable to differences in their stages of
> literacy development, but that others might be
> attributable rather to differences in the personal
> characteristics of the children as individuals"
> (Rieben et al, 1991, p.99).

A possible explanation for such differences is the view that reading
and spelling are constructed on different representations in the lexicon,
(Bradley and Bryant, 1983). This could explain why some words can be
read but not written, or written but not read.

Bryant and Bradley's hypothesis (op cit) that children spell primarily
by constructing words from phonological segments was tested by using a
phonological interference test which should, if their hypothesis was correct,
impair spelling ability. Forty children between 6 and 8 were tested, and the
results showed that phonological interference does impair spelling but
leaves whole word reading intact. However, the conclusion they reach that
children "do write words by building up phonological segments" may not be
fully accurate. They go on to say

> "This seems to be generally true of younger children,
> but true only of the older children's spelling of the
> more difficult words. The older children may not rely
> on the phonological strategy to spell easy words"
> (Bryant & Bradley, 1983, p.175).

Support for this gradual increase in detail comes from the work of Ehri and
Wilce (1982). Their work with silent letters in children's spellings found that
silent letters are harder to remember than pronounced letters, but that once
stored become more salient in the memory representation, presumably
because these are significant as means of remembering and identifying the
word.

> "learning the spellings of specific words provides
> people with visual symbols of their pronunciation. The
> symbols sit in memory and influence how people
> conceptualize sounds in the words, how they say the

words, and how they process relationships among spoken words"
(Ehri, 1991, p.69).

3.6.10 Does the type of word affect the process?

Foorman, Francis, Novy and Liberman (1991) found that all children in their study spelled phonetically regular words better than exception or irregular words. They also concluded that those classes receiving more letter- sound instruction showed a more rapid decline in non-phonetic reading and spelling errors.

Is there a relationship between phonemic segmentation skills and the ability to use a non-lexical approach to spelling? This was explored by Holligan and Johnston (1991) whose study, involving poor readers/spellers and younger children of similar abilities, found no significant differences between the two groups in terms of the proportion of phonetic errors made. Both the poor spellers and the control group spelt regular words better than irregular words, which for the researchers cast some doubt on the existence of the dual route approach. Regularity effects are supposed to indicate the use of phoneme-grapheme correspondence, yet the poor spellers were impaired in their ability to spell words in a phonetic form easily 'read' by a reader. They discuss whether the analogy approach might lead to more accurate spelling of regular rather than irregular words, as regular words have more orthographic neighbours than irregular words, allowing the use of analogy in selecting an appropriate spelling representation. They question whether those studies which have shown that poor spellers make fewer phonetic spelling errors than their controls really demonstrate phonological dysfunction, as some studies have suggested, and suggest the impairment may be more to do with the efficient storage of visual information about spelling. (The poor spellers could detect the sequence of consonants and vowels as well as the control group, but were inferior in their ability to represent these sounds according to English orthography).

3.6.11 What do spelling errors show us?

"The clear consequence of having a standard orthography
is that you can make spelling errors"
(Carney, 1994, p.66).

In Carney's view, many studies have analysed spelling errors according to their own criteria, but literacy research requires a wider set of categories. The focus on spelling errors is exemplified by Read's work

> "... spelling errors are the primary data, not because they constitute failures of learning or teaching, but because they give us clues to children's judgements. Standard spellings cannot do that; we can never be sure that a standard spelling does not come from memory, copying or direct instruction, i.e. processes which do not tell us much about children's knowledge of language. But we can be almost certain that a nonstandard spelling of an everyday word did not come directly from print or from an adult, so we can make inferences about the child's contribution."

and

> "But our interest in spelling errors ... arises first because they are evidence of basic knowledge and processes"
> (Read, 1986, p viii-ix).

This assumes that correct spellings do not provide such evidence of knowledge and processes, and although it is true that errors can provide more qualitative information, it is over-simplistic to ignore the information which correct spellings can provide. The use of a correct spelling demonstrates that this has been successfully stored in, and retrieved from, the mental lexicon, and this is an essential aspect of development if the writer is to be freed from constant assembly.

We can only really identify the use of lexical spelling when the speller spells irregular words correctly. We can only identify the use of a phonological strategy if errors are made, as phonetically regular words could have been produced by either of the two strategies. Therefore if an error preserves the sound structure of the target word then we can deduce

that the phonological strategy is being used, and this is particularly obvious with irregular words.

Carney (1994) identifies two basic types of spelling error - a competence error which is a fairly consistent misspelling, and a performance error which is a temporary lapse. He also states that casual spelling errors cause little difficulty for the reader because they are usually caused by an error of choice among the possible / competing spellings of the phoneme. Other errors could be termed slips, and are unintentional errors rather than errors of understanding. Slips on a typewriter may reflect key positions.

Lexical errors also exist, where the spelling is correct but is the right spelling of the wrong word. These represent confusion between similar sounding morphemes or words. Other errors are analogy errors, where the word is deemed incorrectly to be similar to another. For example, **apostrophy** could be a false analogy with **trophy** or similar words, rather than with **catastrophe**.

Carney states that "Successful spelling depends to no small extent on the relative awareness of the speller" (1994, p.102). He identifies three aspects of awareness as crucial:

♦ phonological awareness-an awareness of the phonology that underlies the writing system when it differs from the accent of the speller

♦ system awareness - the association of vocabulary with spelling convention, and

♦ lexical awareness -the ability to recognise recurrent elements of word structure and to review the range of possible structures within which a morpheme can occur.

Error analysis is of widespread interest to many researchers, but what can spelling errors tell us? Depending on the researcher's viewpoint, error typology may be seen to be based upon the hypothesis that one or other of the two main processing routes is dysfunctional (Frith 1980; Nelson 1980). A reliance on the rule-based (non-lexical) route would result in words with predictable sound-to-spelling correspondences (regular words) having a higher probability of being spelt correctly than words whose sound-to-

spelling relationship are less predictable (irregular words). Also, phonetically acceptable misspellings of unfamiliar words would be made, suggesting that unknown items are processed via the non-lexical route.

Other researchers have studied spelling errors in relation to lexical storage and access. A study of the spelling errors of two university students by Campbell (1987) led to her conclusion that consistently made mistakes are words which are represented incorrectly in the subject's reading lexicon. In this way, they have the status of words and could not be recognised as incorrect spellings because of this. Funnell (1992) studied this in Sterling with two younger children and concluded that she could not support Campbell's findings. Funnell's view is that in order to recognise a correct spelling the word has to be in the subject's reading vocabulary. To detect a misspelling, the person must know how to spell the word. Campbell claimed that the words spelt inaccurately were stored in the students' lexicons incorrectly, but Funnell's view is that the words used by Campbell were "not the subjects' own, and so had no status in the lexicon." Funnell discovered different processing requirements for recognising correctly spelled words and detecting misspellings, and the fact that she found two ways with two children might suggest that each individual approaches such a task in his own way.

Dodd (1980) cites Day and Wedell's (1972) examination of the spelling errors made by normally hearing children with no special spelling difficulty. The children were put into three groups: those whose auditory memory was better than their visual memory, those whose auditory and visual memories were equal, and those whose visual memory was better than their auditory memory. No significant difference was found in the number of errors made by the three groups, but the types of error differed. The children with better auditory memory made more letter insertions, omissions, or inversions of adjacent letters. Those with equal memories applied phoneme-grapheme rules, and those with better visual memories made more syllabic confusion errors.

The worries which are sometimes expressed by teachers and parents about non-conventional spellings or experimentations becoming established within the child's lexicon are unfounded if one takes the view

that spelling is a process of abstraction of principles rather than a process of acquiring habits. However, it may be that spelling can be both. Perhaps more effective and efficient spellers are able to abstract principles, but otherwise words can be acquired as unrelated "habits".

Funnell (1992) asks how we know a word is misspelled. How can we explain the fact that we can write some words fairly easily, yet when presented with a visual form of the word we cannot say if it is correctly spelt or not? How does this relate to the idea of a lexicon?

This would link quite well to the various ways of remembering, that is, to ways of committing words to the lexicon. Those words we do not know well have not been securely committed, and the lexical image is not sufficiently developed. This in turn could relate to the manner in which words are stored in our lexicons - such as the fact that an understanding of the morphology can enable links to be made between words which may help us to store them efficiently and to access them more readily.

The actuality of spelling may be more complex than some of the debate would suggest. There are a number of studies which indicate this complexity, such as the longitudinal study conducted by Francis (1994) which examined children's spelling in free writing. She found

"Such sampling yielded mis-spellings of both regular and irregular words representing inaccurate recall of familiar written words and partially successful construction of unfamiliar words. They were compiled from elements of similar known words, letter names, letter sounds and groups of letters for sounds. In no case did the sum of a child's spellings and mis-spellings indicate a reliance on recall or on construction alone. There was evidence of both for all children at all three testings. The measure selected for quantitative assessment of spelling error was the percentage of mis-spelled words in a written story. (Spelling accuracy was its obverse). This measure clearly did not show a linear relationship with age. The error percentage was higher on the third occasion of testing than on either the second or the fourth. This might be expected if constructed spelling was attempted more than previously but not yet mastered as well as later, and if accurate recall was still limited to relatively few words"

(Francis, 1994, p.34).

3.6.12 Summary

How do children begin to represent speech through writing? Research has suggested that the development of phonological strategies tends to follow certain trends. For example, Read (1971, 1975, 1986) pioneered the idea that children's misspellings reflect a developing sense of phonemic properties in words and he (1971, 1975) and Chomsky (1971, 1979) suggested that children's invented spellings were systematic, rule-governed and consistent.

Bradley (1988) summarises that skilled readers will use more than one strategy in reading and spelling (phonological recoding and direct visual access) and showed that beginning readers will sometimes use different strategies to read and spell the same word. She suggests that her work with Bryant has shown that teaching children the connection between the two strategies - phonological (rhyming words) and visual orthographic (plastic letters) strategies - has been shown to result in children making more progress in reading and spelling. Their conclusion is that the method's success lies in teaching the connections between the two strategies, which children initially keep separate.

> "The fact that spelling phonetically at first does not appear to hinder [this] development suggests that learning to spell is not just acquiring habits. Rather, spelling truly develops, rather like children's drawing, from representing salient and concrete properties with a few simple strategies to representing more abstract properties with a variety of strategies"
> (Read, 1986, p.41).

Having accepted the existence of the mental lexicon, all beginning writers would have a lexicon acquired from their experience with speech. Ehri (1984, 1994) proposes that the adult lexicon contains word units with several identities. Each has a phonological identity, a syntactic, and a semantic identity, and to these are added, through the process of learning to read and to write, an alphabetic image of the word. Images are integrated

111

together (unitization) and thus alphabetic representations come to function as symbols for meaning as well as sounds. Ehri's later work (1995) sees reading as a connection-forming process, and this model might also apply to spelling.

If Ehri's view is accepted, then the development of the lexicon from its initial speech experiences is central to understanding spelling development. Perfetti's (1992) view of the developing lexicon would also become important to educators. The writing of the children in the present study will be examined to see whether any support for the theories of development can be found.

3.7 Classroom Practice and Pedagogy

3.7.1 Introduction

The focus of this chapter has thus far been on the learner and on the learner's development as a writer. In this section, attention will be shifted to instruction. As spelling is a subskill of writing, a brief overview of each will be offered.

As this study is focused on the first three years of formal schooling it is important to consider instruction in the form of classroom practice and the role of the teacher. This is not to deny or ignore the considerable learning which occurs before formal education for many children, or learning which takes place in the home during the years of schooling, but which are both beyond the scope of the present study. Rather these will be taken for granted, and the individual differences between children will be considered as part of the data. The primary focus within this study is the possible difference between approaches to the teaching of writing. Pedagogy and classroom practice are therefore central elements of this study.

3.7.2 The influence of pedagogy

Pedagogy derives, in part, from the view held by schools as institutions, and by teachers as individuals, of the nature of pupils' learning and its relationship with teaching methods. A teacher's philosophy of

education, whether implicit or explicit, will directly influence the teaching and learning approaches within the classroom.

"Intended classroom learning is embedded in the tasks the teachers provide for children" (Bennett et al, 1984, p.45).

This is true of pedagogy in general and of the approaches adopted to the teaching of writing in particular.

Schools approach the teaching of writing and spelling in different ways, and in determining the theoretical context for this study it is necessary to consider the influences on teachers, and on teaching and learning, which have shaped classroom practice. This is not a simple task for, as Hall (1987) states,

"Once assumptions become entrenched in practices that become conventional, they cease to be reflected upon and tend to take on an axiomatic quality which appears to render them safe from examination" (Hall, 1987, p.80).

These "conventional practices" not only cease to be reflected upon, but tend to be made explicit only in a descriptive manner in school prospectuses and in school policy documents. The theoretical background for these teaching philosophies is rarely stated, and can sometimes only be inferred from the considering the evidence provided by the teaching approach.

Kress (1994) accepts that practices depend on and derive from theory.

"This theory may be an unofficial, unarticulated one, held by one or several practitioners, or it may be the official theory, widely held and supported... Changes in theory are, conversely, bound to affect practices. In short, practices can only be as good as the theory underlying them" (Kress, 1994, p.6).

Whatever the theoretical underpinning, research on nearly 1,000 children by Peters demonstrated the importance of schooling.

113

"For it is the behaviour of the teacher in the classroom that determines whether children learn to spell, and not books, materials and computer programs"
(Peters, 1985, p.86).

Street (1997) reminds us

".. there is no necessary one-to-one relationship between a specific theory of literacy and a specific teaching method"
(Street, 1997, p.53)

but the general relationship between how teachers perceive learning and how they teach remains clear. The National Writing Project (1985-88) summarised how theory underlies practice in its 1989 publication 'Becoming a Writer'.

"Whatever aspect of learning is considered, there is always speculation about how children do it. Is there some innate mechanism controlling development? How much learning is a question of imitating those around them? Are children actively involved in working out the adult systems? Is there a fixed order of development? Do different environments affect the rate and direction of development?

These are key issues about how a child learns, issues which either implicitly or explicitly underlie teaching methods. A classroom, for example, where children spend considerable time copying letters beneath the teacher's clear print runs on assumptions about learning which are very different from those of a classroom where children write independently, inventing letter shapes and spelling. These assumptions rarely surface for close interrogation"
(N.W.P. 1989, p.7).

The final paragraph of this quotation alludes to two different approaches to the teaching of writing, and these are of central interest to the present study In order to establish the present context, the source of these different approaches will be briefly considered.

3.7.3 An outline history of the teaching of writing and spelling

Literacy was the primary reason for the introduction of compulsory schooling in this country, yet the literature presents very little description of how the beginning stages of writing have been taught during the last hundred years. What is evident is that our understanding of the writing process and our expectations of children have increased dramatically during recent years, both in terms of the type of writing undertaken and the amount expected.

The Revised Code of 1862 required only transcription or dictation until children were in Standard VI, about twelve to thirteen years of age. Evidence relating to how writing was taught survives in the materials which have been preserved, mainly by individual collectors and groups such as the Ephemera Society, whose exhibition and accompanying booklet (Rickards, 1986) recorded the use of writing sheets for calligraphic exercises and the widespread use of copybooks during the eighteenth and nineteenth centuries.

Copying and tracing traditionally formed the main approach to teaching writing in British schools. Until the 1970s writing was taught primarily by means of the child copying the adult's words, often initially writing over the teacher's writing then by copying underneath the written text. Along with tracing exercises this approach was widespread, and is still in use today. The teacher was very much in control of the composition and creation of the text, with the child merely copying what the adult provided. Children were often given the message of the text by the teacher, and this sometimes involved the adult adapting the child's dictation to fit the intended purpose. This method of teaching divorced the secretarial and the compositional aspects of writing, but had the benefit of producing accurate spelling in children's work, provided their copying was systematic. The cognitive challenge was removed from writing, reducing the need for the young writer to see communication as central to writing. This is the approach to the teaching of writing which has been termed traditional within the present study.

The introduction of writing by such tracing and copying activities shows that it was viewed as a predominantly visual and motor skill rather than as a cognitive and generative task, and the methods of teaching reflected the development of such skills by practice and repetition. The behaviourist view of writing which led to copying and tracing also influenced the teaching of spelling. Schonell, writing in 1932, stated that drill methods were indispensable in junior classes (1955, p.13) although the later Plowden Report (D.E.S., 1967:520) reported that long periods of drill and repetition were not proved to be effective.

Schonell's approach focused on the production of spelling lists which were to form daily exercises for all children. His booklet "The Essential Spelling List" remained in use for many years, and is still available for purchase today, having been revised by Pamela Wise in 1985. Schonell did not offer advice on how the words should be presented to children, but he did refer in the text accompanying his lists to the importance of children attending to the parts of the word as well as to the whole and to the "development of an analytic and synthetic attitude in word observation" (1955, p.17). Personal experience has shown that this was not always noted by users.

Schonell's work had a great influence on classroom practice and this approach is still in use today. The use of spelling lists has been questioned by educationalists such as Grace Fernald (1943) and Peters (1985), and Hanna and Moore (1953) identified the weaknesses of manual repetition.

> "There is no evidence to indicate that the average child retains for very long the spelling of words learned in this fashion"
> (Hanna and Moore, 1953, p.329).

Patterson's review of research in spelling (1961) stated that in most schools one or other of two methods of teaching spelling was in everyday use:

1) the words were set to be studied and learned either in school or at home, and the degree of mastery was tested next day either orally or in writing, or

116

2) dictation led to the identification of words needing to be learned, followed by the above method.

Patterson states

> "each has one vital omission; there is no indication to the child of the way in which he should set about learning the spelling of the words"
> (Patterson, 1961, p.83).

> "There is a growing awareness that these teaching devices, even when conscientiously and consistently used, may give a poor return for a large amount of energy expended, and may still leave the spelling lesson a formal and rather barren exercise"
> (Patterson, 1961, p.87).

Patterson (1961) suggested a multi-sensory approach, involving visual, auditory, oral and kinaesthetic involvement. This had also been suggested by Schonell (1955) and Peters (1993), and the latter stressed that visual factors and the speed and legibility of writing are important. "This is obvious, since spelling is a hand-eye activity" (1993, p.2). Her work was influential in promoting the use of the look-cover-write-check routine which is still much used in schools. Many teachers have also accepted the idea of linking spelling with handwriting (e.g. Cripps, 1995; Peters, 1994). The idea that letter strings could become physically automatic if learned and practised systematically formed the basis of this development, although the weaknesses in this assumption were outlined in the earlier section on the physical aspect of writing (3.3.2).

The suggested shift in approach from memorisation of spelling towards a more multi-sensory approach has influenced the work of teachers in some schools, although rote learning of spellings is still a regular feature of many. Teachers have been criticised for a lack of theoretical knowledge applied to the spelling lesson. For example, the authors of the teachers' handbook to Breakthrough to Literacy commented

> "the traditional spelling lesson is an ad hoc approach
> to the task of internalisation and one for which lack of
> awareness of the working of the orthography falls back
> on random procedures and on rote learning"
> (MacKay, Thompson & Schaub, 1978).

A key feature of the teaching of spelling has been the identification and correction of spelling errors in children's work. As Torbe (1977) pointed out, this is insufficient, and the teacher's role should not focus on those mistakes the child has already made, but on helping the child not to make the same mistakes again.

The traditional method of teaching generally resulted in children who did not see writing as pleasurable. In a national survey of attitudes conducted amongst British eleven year olds in 1982, 38% agreed with the statement that "they only write when they have to" and 40% looked forward to the time when they would not have much writing to do (Gorman et al, 1988).

Teachers' expectations of children in the nineteen thirties, in relation to independent writing in the infant school and lower junior school, rarely extended beyond a sentence or two and the answering of questions (Plowden Report, D.E.S., 1967). The demands for children to write spontaneously and creatively, inventing stories and writing for different purposes, grew during the sixties and seventies, although schools varied greatly in the demands placed upon children with regard to writing. The introduction of the National Curriculum in 1989 saw a wide range of writing specified for each Key Stage, with all maintained schools legally required to meet these requirements.

These varying approaches to writing and spelling are now recognised to place differing demands on the writer;

> "In copying, sight and perception of the form of the
> visual symbols are foremost, as are the faculties of
> motor innervation required for execution. In dictation,
> verbal understanding of the text transmitted orally by
> another and transcription into graphic symbols are
> essential. In spontaneous writing, it is necessary to set

down in symbolic form material formulated by the
internal language, and a choice must be made from
among the forms of speech and the graphic symbols
that society has made available to us....."
(de Ajuriaguerra and Auzias, 1980, p.70).

3.7.4 Weaknesses in the copying approach

The appropriateness of tracing and copying to writing development
has long been questioned.

"There seems to be no clear evidence that motor
practice such as tracing or copying will facilitate
learning a verbal naming response to the visually-
presented graphic stimulus or even recognition of it"
(Gibson & Levin, 1975, p.243).

The extent to which copying leads to effective knowledge of
graphemes and their relationship with phonemes is unclear and research is
limited, but studies suggest that tracing and copying letter-like symbols was
less effective in developing kindergartners' later letter recognition than was
visual discrimination training (Williams 1969, 1975). Adams (1990) points
out that copying can be done without considering the letter's sound or name,
or its distinctive features and states,

"By extension, because tracing can be done without
thinking about the letter's overall form, function, or
identity, it may add very little to the child's letter
recognition facility"
(Adams, 1990, p.355).

3.7.5 The 'new' approach - generative or developmental writing

Recent developments, such as the studies of young children by Read
(1986), Ferreiro and Teberosky (1982), Harste, Woodward and Burke
(1984), Calkins (1986), and others, plus the work in England of the National
Writing Project (1985-89), led to teachers' increasing understanding that
young children were bringing more implicit literacy knowledge with them to
formal education than had been realised, and that writing development was

119

a highly complex cognitive process. Once teachers started to create different classroom opportunities for literacy and to carefully observe the responses of the children to these, a shift in approach was observable in some schools.

During the late 1980s and early 1990s some teachers started to adopt a generative approach (Clay, 1975) whereby children's early writing experimentations were recognised, valued and used as the basis for assessing their understanding of the writing process, and the National Curriculum of 1989 required that the assessment of children's writing should be applied to a piece of unaided, independent writing. For those teachers not using this approach, this required children's own efforts or `emergent' writing to become part of classroom practice. Once there was an external requirement to make such practice part of normal classroom routine, the former reliance on copying was reduced, or copying became used alongside generation in infant classrooms.

> "... the last ten years have witnessed a veritable revolution in the way teachers in many western countries have viewed the development of children's writing"
> (Smith and Elley, 1998, p.36).

This recent shift in teaching approaches to early reading and writing in British schools has resulted in a move away from an over-reliance on tracing, over-writing and copy-writing to a generative approach where children's emerging writing abilities are accepted and valued. Providing meaningful contexts for reading and writing is seen as the key to helping children understand writing's purpose as a means of communication. The theoretical underpinning for this comes from constructivism, and the child is recognised as an active learner making sense of an abstract system within a social context. The developmental approach is now endorsed, and required, by the National Curriculum (D.F.E., 1995),

"Pupils' early experiments and independent attempts at communicating in writing, using letters and known words, should be encouraged"
(D.F.E., 1995, PoS, 2a).

This generative approach, which encourages children to see themselves as writers and which values creative attempts to represent writing, no matter how incorrect such attempts might be, is the basis for the approach termed developmental within this study. It requires children to take greater responsibility for their writing behaviour, particularly the message to be communicated, and gives them the opportunity to demonstrate the extent of their knowledge of the various aspects of writing, rather than copying the teacher's words.

The term "eclectic" is used in this research to indicate a teaching approach midway between "traditional" and "developmental".

3.7.6 Recent developments

The question of whether spelling needs to be taught, or whether it can be "caught" has long been asked.

"The arguments about spelling go back a long way. Almost a century ago to this very year there was openly expressed anxiety about standards; and certainly around the turn of the century the debate was in progress as to whether spelling should be directly taught or could be breathed in naturally if the air was right"
(D.E.S.1975 [Bullock Report], 11.44).

Peters continued this debate with her book "Spelling: caught or taught?" (1985) and in 1991, Krashen and White re-examined previous studies of spelling in an attempt to determine whether spelling is acquired or learned They applied common statistical tests to the original data of Rice and Cornman and, for the most part, confirmed both researchers' claims that formal instruction in spelling has limited effects. They conclude that both implicit and explicit learning of spelling take place, but that the former is much more powerful. This finding could relate to lexical organisation, and to

121

the potential for an individual to create an internal model of our orthography which enables efficient and correct spelling.

As yet, few studies have been conducted which compare the relative writing performances of children being taught to write by traditional and developmental approaches. Clarke (1989) conducted a Canadian study of 102 middle class students from four first grade classrooms. All were taught by using basal readers plus phonics. All wrote creatively for 80-100 minutes each week. In two classes children were encouraged to invent spellings, and in the other two they were encouraged to spell correctly. Clarke collected writing samples between November and March. She discovered that children using traditional spelling wrote with slightly more sophisticated vocabulary and more complex syntax. They made fewer spelling errors (6%) than those using invented spellings (34%). She also found that children using traditional methods tended to write much shorter stories. In March they averaged 13 words, whereas the invented spellers averaged 40.

Clarke gave the children a spelling test. She found that both groups showed considerable but comparable difficulty in spelling high frequency but orthographically irregular words. The children used to invented spelling were significantly more successful with both a list of lower-frequency regularly spelled words and with the words on the Level 1 Spelling Subtest of Wide Range Achievement Test.

The invented spellers in Clarke's study seem to show a definite advantage. The mean of the traditional spellers is lower, but closer examination shows that the range of scores is greater - implying that the benefit of emphasising correct spelling is far less even across students. Adams(1990) suggests that the differences occur because the developmental spellers were on their own from the start and had to "confront holes in their knowledge" (1990, p.385), working out the system for themselves.

Thus, the implications of the research led to the suggestion that the developmental model calls for new thinking about instructional practice, especially in the construction of the spelling curriculum and the teacher's role in instruction (Nelson, 1989). The importance of each individual being an active learner, forming and testing hypotheses and gradually making

122

sense of the orthographic system is central to this approach. The National Literacy Strategy, implemented from Autumn 1998, gives specific advice about the direct teaching of writing and of word-level work in an attempt to raise national standards of literacy by the year 2002.

3.7.7 Summary

Over the years of compulsory schooling the behaviourist influence on the teaching of writing and spelling has prevailed. Spelling has been taught by encouraging the memorisation of words from word lists, and traditionally children have been taught to write and spell by copying from a blackboard or copybook, with neatness a key requirement. By the late seventies the multi-sensory approach was gaining some popularity, and the view of writing as a cognitive activity has slowly developed. Smith (1982) put forward the idea of the writer having the two roles of author and secretary, and Graves (1983) and the National Writing Project (1989) introduced the idea of process writing where children compose without initial concern for accurate spelling. The National Curriculum now requires all schools to adopt a developmental writing approach in some form due to the assessment requirements.

No one current theory is sufficient. Imitation and reinforcement obviously play their part, as do cognition and social interaction. Many writers, however, favour the social interactionist theories as the ones most suited to literacy development (Holdaway, 1979; Tann, 1991; Garton & Pratt, 1989) but recent research has taken this a stage further by looking at how children learn.

As schools differ in the nature and the speed of their response to changing or evolving theories of learning, it was possible to identify a range of approaches to the teaching of writing which could be identified for this study. Some schools maintained a "traditional" approach to the teaching of writing, using a combination of tracing, over-writing and copy-writing to teach letter formation and production. Such schools would provide a correct version of writing, usually written by the teacher, for the child to copy, and as the child's proficiency increased would use dictionaries and word books to provide correct spellings for the child to copy. Some schools were

influenced by the work of the various writers and researchers already discussed, and began to adopt a more generative approach to the teaching of writing. This involved asking children to "write", and using the marks made by the children to assess and build on the children's level of understanding. In the present study the latter approach is termed "developmental". Other schools adopted approaches which might be considered as on a continuum between these two.

In the present study schools were asked to rate their approach to the teaching of early writing, and these self-assessments were used as the basis for sampling.

3.8 Conclusion

From the literature review which has been presented, certain behaviours might be expected of the children in the present study. The key aspects of these are summarised in this section.

The study might find evidence that children have difficulty segmenting sound, particularly in identifying word boundaries, syllables, and phonemes. Conscious phonemic manipulation seems likely to follow the development of reading ability (Read et al, 1980; Goswami & Bryant, 1990; Goswami, 1995; Morais & Mousty, 1992) so may not happen for many children until after a year has been spent in school (section 3.2).

The physical demands of writing are likely to affect graphic production, up to the age of six. The results of the study might be expected to show a continuum from scribble to writing, with drawing present in some writing samples. A range of understanding in relation to the speech/print relationship would be expected (section 3.3).

In relation to the message concept, a range of behaviours similar to the seven identified by de Goes and Martlew (1983) might be expected, with some children not understanding functional significance and some electing not to write (section 3.4).

Regular and irregular words might be expected to cause different challenges for children.

The study might provide evidence of lexicons developing (eg Perfetti 1991, 1992) or of the dual routes to spelling development. It might also

provide evidence to support earlier studies. For example, it might show evidence of young children using phonology and systematic approaches to spelling (Read, 1980), evidence of the logographic stage (Frith, 1980) or evidence of distinct stages as outlined by the Virginia School (section 3.5).

CHAPTER 4: THE DESIGN OF THE EXPERIMENT

4.1 Introduction

This longitudinal study into children's spelling development during the first three years of schooling is set within the theoretical context of constructivism, with children seen as active participants in the process of literacy development. Children are not seen as passively assimilating a body of adult knowledge but actively working out for themselves how the writing system is organised and used. This study is premised upon the beliefs that spelling is a complex cognitive process (e.g. Flower & Hayes, 1994) and that successful learning of spelling can lead to automatic and conventional spelling production requiring little or no conscious effort. The hypotheses to be explored were derived from theories of writing as a socio-psycholinguistic process which hold that even beginning writers are active theory builders and hypothesis testers (Barnes, 1992; Harste, 1994). The work of researchers such as Clay (1975) and Dyson (1985, 1994) led to the consideration of the message concept in this study, and to the underlying assumption that an examination of early writing might permit examination of the cognitive process supporting writing (Read, 1986; Frith, 1980). Theories related to developmental progress (Luria, 1983; Ruddell & Ruddell, 1994) and to the organisation of lexicons (Ehri, 1991, 1995) have also influenced the design of this work. The study is also designed to test the belief that such development can be influenced by the educational orientation of the school and the teaching received.

The aim of the study was to monitor the development of conventional spelling in children's unaided writing during their infant education (depending upon their age and therefore their admission date to school). The first of the independent variables (IVs) relates to the perceived approach to the teaching of writing and spelling which was claimed by the schools. Two schools formed the sample relating to a "developmental" approach, and two schools represented a "traditional" approach, as defined in Chapter 3. A further two schools were

126

selected from those identifying themselves as having an "eclectic" approach.

The hypotheses were also designed to examine theoretically based ideas such as whether sex and age had systematic and predictable effects on the pupils' behaviours under consideration. Many studies have suggested that there is a difference in performance between boys and girls with regard to reading and writing. It would be expected that maturation would correlate with performance, as children in the early years of education are constantly learning and adding to their knowledge of how their language, both oral and written, works.

In addition, the admissions policies with regard to the age at which children start school vary from area to area. In the education authority used for this study a two-cohort entry was used. As the older children were thus entitled to an extra term of education, it was thought that this might differentially affect performance and therefore cohort was included as a third independent variable. Exploring the similarities and differences between the two cohorts (which are indicative of age difference) is particularly important to educationalists, given that current assessment and testing systems (SATs) do not make any allowance for age and assume all children to be directly comparable by the end of Year 2.

The final IV, occasion, took account of the potential development over the eight or nine terms of infant education (depending on cohort).

4.2 An overview of the methodology

Six schools were selected for the study, two to represent each of the three types of approach to the teaching of writing specified earlier, following completion of an initial postal questionnaire. All children starting these schools in the academic year 1991-92 were studied for a total of three years, with termly unaided writing samples collected and analysed and an annual spelling test being administered. All samples were obtained during small group work so that children's responses could be carefully monitored. Writing was analysed using the CHILDES (Child Language Data Exchange System) program. Further details of the methodology are provided.

127

4.3 The variables

In order to examine the development of conventional spelling during the three years of infant education, this study was designed to consider the relationship between four independent variables, namely

  IV 1 schools' stated approach to writing instruction
     (traditional, eclectic or developmental)
  IV 2 sex (male or female)
  IV 3 cohort (September or January admission to school)
  IV 4 occasion (terms 1-9)

and six dependent variables. These were

  DV 1 the message concept (i.e. whether or not a message was
     ascribed to the text)
  DV 2 the total number of words produced in the writing sample
  DV 3 the number of different words written
  DV 4 the total number of correctly spelt words written
  DV 5 the number of different correctly spelt words written
  DV 6 the spelling test results.

4.4 The hypotheses

The hypotheses are each presented in the null and non-directional alternative forms. This is done deliberately, and indicates the caution with which the investigation was approached. The hypotheses which were to be tested were as follows;

Ho(1) **Null hypothesis: stated approach to spelling instruction (traditional v eclectic v developmental)**
     There will be no real difference between the means scores of the children receiving different stated approaches to spelling instruction on each of the six dependent variables.

Hi(1) **Alternative non-directional hypothesis: stated approach to spelling instruction (traditional v eclectic v developmental)**
     There will be a real difference between the mean scores of the children receiving different stated approaches to spelling instruction on each of the six dependent variables.

Ho(2) **Null hypothesis: sex (boys v girls)**
     There will be no real difference between the mean scores of boys and girls on each of the six dependent variables.

128

| Hi(2) | **Alternative non-directional hypothesis: sex (boys v girls)** |
| | There will be a real difference between the mean scores of boys and girls on each of the six dependent variables. |

Ho(3)	**Null hypothesis: date of admission to school (Sept. v January)**
	There will be no real difference between the mean scores of different cohorts on each of the six dependent variables.
Hi(3)	**Alternative non-directional hypothesis: date of admission to school (September v January)**
	There will be a real difference between the mean scores of different cohorts on each of the six dependent variables.

Ho(4)	**Null hypothesis: occasion (1 to 9)**
	There will be no real difference between the mean scores on different occasions of each of the six dependent variables.
Hi(4)	**Alternative non-directional hypothesis: occasion (1 to 9)**
	There will be a real difference between the mean scores on different occasions of each of the six dependent variables.

Ho(5)	**Interactional null hypothesis**
	There will be no real interaction between any combination of the four independent variables and any of the six dependent variables listed above.
H1(5)	**Alternative interactional hypothesis**
	There will be at least one real interaction between any combination of the four independent variables and at least one of the six dependent variables listed above.

4.5 Sampling criteria

In order to meet the stated objectives and to gather data appropriate for testing the hypotheses derived from the stated variables, several criteria were identified as important for sampling purposes;

♦ that those schools selected should have within the infant department or school a shared and written philosophy or teaching approach to the development of children's writing

♦ that the sample should include schools which rated their approach to the teaching of writing as "developmental" "eclectic" or "traditional" according to given descriptors

- that there should be similarity between the schools selected for the study in terms of size, type and location.

A questionnaire (Appendix 1) was designed and used to address the first two of these criteria. For the third, the information was helpfully supplied by Education Services of the Local Education Authority.

The questionnaire was distributed to all 127 infant and primary schools in the specified administrative area. The response rate was 55%. Of the 71 replies, 50 schools indicated that a school policy existed for writing, and these represented the population from which a sample of schools stratified by three approaches to the teaching of writing would be selected. Via the head teachers, the schools were asked to indicate where their approach to the teaching of writing would be located on a continuum from traditional to developmental, with descriptors provided to clarify these terms (see Appendix 1). The responses were converted to numerical scores and the standard deviation was calculated. For those schools rating their approach as "developmental" or "traditional" the random sample was taken from those more than one standard deviation from the mean. For the "eclectic" category the random sample was taken from those rated within 1 standard deviation of the mean.

In order to ensure that the schools selected for the study were broadly similar, it was decided to focus on those of Group 2 size (figures from September, 1991) and of County Primary status.

Following the analysis of the results from the questionnaire survey, two schools were randomly selected from within each category, and were asked to participate in the study. Five agreed, with a further selection being necessary from the "traditional" category to make the sixth.

To summarise, the sample of schools, stratified by three approaches to the teaching of writing, was identified using random number sampling from those schools which

- responded to the postal survey
- met the requirement of having a written policy on language development, and in particular the teaching of writing and spelling
- were of Group 2 size
- were of county status.

The six schools represented two professing an eclectic approach to the teaching of writing and spelling, two a developmental and two a traditional approach. For the purpose of this study it is the type of instruction which is of interest, so the focus will be on the three approaches to the teaching of writing and spelling rather than on similarities and differences between individual schools.

4.6 The pupils: the final sample

The sample population consisted of those children admitted to the Reception Year of these six schools during the academic year 1991-92. This consisted of two cohorts due to local admissions policy. At the time of the study, children who had their fifth birthday between September and February started school in September, and children born between February and the end of August were admitted in January.

As the study is concerned with the development of writing across the three years of infant education, any child who left the schools during the study was excluded from the final analysis. Similarly, any child who joined these schools during the course of the study was also excluded in order that the teaching methods adopted with the children were known and documented.

Table 4.6.1 provides details of the final sample.

TABLE 4.6.1 SAMPLE BY STATED APPROACH TO INSTRUCTION, GENDER, AND COHORT.

	TRAD.	ECLECTIC	D'MENTAL	TOTAL
MALE				
Cohort 1 (n)	14	13	17	44
Cohort 2 (n)	23	13	10	46
FEMALE				
Cohort 1 (n)	12	21	13	46
Cohort 2 (n)	16	17	15	48
TOTAL (n)	65	64	55	184

4.7 Methodology

Two main approaches have been adopted in the study of children's spelling, a naturalistic approach and an experimental approach (Treiman, 1990). Experimental studies are those in which children are presented with words or lists of words to spell, whereas the naturalistic approach examines the spellings which children produce in the course of their normal writing. Both types of study have strengths and weaknesses. This study adopts an approach which is essentially naturalistic, in that children's writing samples were obtained during their unaided writing, but it also contains an experimental element in order to ensure a more comprehensive study. This involved a spelling test which was presented at the end of each academic year.

4.7.1 The message concept (DV 1)

A key feature of this study was the intention to study the development of the message concept. The statistics presented in relation to this variable are different from those presented for the other dependent variables. Message concept can be considered from three distinct yet related viewpoints. These can be differentiated as A, B and C. Message Concept A is an abstraction and cannot be measured. Message Concept B refers to the manifestation of Message Concept A observed in everyday life, from which the existence of A is inferred. Message Concept C is the sampling of Message Concept B whereby the concept

132

is operationally (and imperfectly) defined and can be measured. The researcher was with each child as the task was completed and it was possible to record

a) whether or not a message was offered

b) what the message was, and

c) how the given message related to the symbols produced by the individual child on the page.

This enabled the analysis of intended messages, which is more problematic if researchers merely analyse samples of graphic representation independently of the child's presence. It was possible to note both the child's verbal and non-verbal reaction both during the writing task and when sharing the finished writing with the researcher. This approach MAY reveal patterns in the children's varying intentions and in the development of the message concept.

To summarize, it was necessary to infer the existence of the message concept in children's writing by observing each writer's behaviour and response to the task. For the purpose of this study, message concept is operationally defined as children's expressive language that either does or does not indicate the communication of a message.

Following the presentation of a common stimulus to each pupil leading to a writing task, open-ended questioning elicited an expressive response which was taken as the manifestation of the presence of the message concept. Although the possible range of expressive language responses (both non-verbal and verbal) is vast, each sample of writing was either ascribed a message by the child, or it was not. The message concept was coded as a two point scale, where 0 represents no message and 1 records that a message is given. There were nine occasions of testing (with 8 for the second cohort). The occasion upon which each child shows evidence of the message concept (with no subsequent regression to non-message scoring) was judged to be the occasion on which the message concept appeared to become established. This resulted in each child being allocated a numerical rating from 2 to 9, representing a score in a time series. A one way analysis of variance was then carried out.

133

It is recognised that this approach to the analysis of message concept, which was determined following considerable consultation, is one of several which could have been adopted. This was decided to be the most appropriate for the present study.

4.7.2 Analysing the writing samples

As the study progressed it became apparent that the actual writing samples being obtained needed to be categorised in a more detailed way than the consideration of previous research of this type had suggested. The hypotheses relate primarily to those writing samples which are recognisable by readers as transmitting information. However, many of the samples which were obtained could not be placed in this category. Few previous studies refer to the use of children's pre-conventional writing samples, so it was not possible to use established classification systems. The following system of categorisation was accordingly devised by grouping the actual samples received into similar categories:

drawings only

drawings plus non-conventional symbols/letterlike forms

drawings plus standard letters/numbers used randomly

non-conventional symbols/letterlike forms only

non-conventional symbols/letterlike forms plus some

standard letters/numbers

standard letters/numbers used randomly

standard letters used purposefully.

This system takes as its base the individual symbol, rather than the word. This is to enable the classification of all samples, including the very first attempts at writing. The inter-rater reliability of this is reported in Chapter 5, where the classification system is described more fully. Once a child's piece of work on a given occasion was classified in the final category, with standard letters used purposefully, it could be coded onto computer for analysis by the Child Language Data Exchange System computer program (CHILDES). CHILDES is explained in

more detail in Chapter 5. These samples form the main source of data for the study.

4.7.3 CHILDES: an overview

In order that the written words in each story could be analysed by CHILDES it was necessary to pair the printed words with the spoken words in the child's "reading" of his/her own script, which was transcribed. Similarly, where word breaks were not clearly identified in the writing, this was clarified while the researcher was still with the child to ensure that the subsequent analysis was accurate. In those instances where the writing bore no relation to what was dictated, or where no message was offered by the child, this was noted and the samples were not used in the detailed CHILDES analysis.

The information which was entered into the computer included

♦ the child's story with all non-standard spellings indicated (these were flagged by the symbol [*]. For example, whent[*])

♦ the conventional version of the child's story

♦ the child's non-standard spelling with the standard version (e.g. whent=went).

Each sample was coded to indicate the occasion, the gender of the child and the child's identity. Subfiles were created to identify children from different cohorts. The CHILDES data provided more qualitative and quantitative data than was needed in the present study. Details of the measurement procedures used are presented in Chapter 5.

4.8 Methods of analysis

Descriptive and inferential analyses, using SPSS version 8, are presented.

4.8.1 Descriptive Statistics

In these analyses, the data from all pupils are used. Frequency, means and standard deviations were calculated for all dependent variables in relation to:

- the total group

135

- all pupils in `developmental' schools
- all pupils in `eclectic' schools
- all pupils in `traditional' schools
- all boys
- all girls
- all pupils in cohort 1
-all pupils in cohort 2.

A selection of descriptive statistics is presented, with detailed discussion and comment where this is warranted. Using the coding key in Appendix 4 plus the data disk (Appendix 2) any further descriptive statistics can be readily obtained for any groups based on any combination of the independent variables in relation to any of the dependent variables. Correlations between DVs 2-5 are presented by occasion for the total sample and for approach, sex and cohort in Chapter 6 and also in Appendix 10. Because the study is developmental, change across occasion of testing is of central interest, and forms the basis for the statistics presented.

4.8.2 Inferential statistics

The majority of the stated hypotheses are tested using selected inferential statistics, including one way and factorial analyses of variance, using SPSS version 8.

> **DV 1** (the message concept) is examined using one way analysis of variance.

The four other dependent variables are

> **DV 2** the total number of words produced in the writing sample
>
> **DV 3** the number of different words written
>
> **DV 4** the total number of correctly spelt words written
>
> **DV 5** the number of different correctly spelt words written.

A series of four way ANOVAs with repeated measures for individuals over the eight occasions is carried out for each DV. The effect of individuals is nested within the cross-classification of cohort, approach and sex.

> The spelling test results (**DV 6**) for the end of each year of the study

are explored using correlations and mixed design factorial ANOVAs. These analyses are applied to the results for the whole test, for the regular words and for the irregular words.

4.9 Handling the data

4.9.1 Screening the data

The data were screened to ensure accurate data transcription and analysis (Tabachnick and Fidell, 1989). The univariate descriptive statistics were checked for accuracy of input by considering whether any out-of-range values existed, and whether the means and standard deviations of each of the variables were plausible. Skewness and kurtosis were examined to ascertain whether results were within expected values. Missing data caused the greatest problem, and will be considered in more detail.

4.9.2 Missing data

Missing data can pose a serious problem to data analysis, but the seriousness of this problem depends on how much data is missing and on why it is missing (Tabachnick and Fidell, 1989). If data are missing randomly across data sets, this does not present a problem, but this needs to be tested as randomness can be incorrectly assumed.

4.9.3 Ways of handling missing data

Following Tabachnick and Fidell's (1989) suggested ways of dealing with missing data, the following options were considered;

1. deleting cases or variables

This can be a useful option if only a few cases have missing data and they are randomly spread. However, if missing values are spread throughout cases and variables, deleting such cases can lead to substantial loss of data.

2. treating missing data as data

Sometimes failure to answer the question or respond is in itself of interest to the study, so the consideration of missing data is important. The existence of missing

137

data is of significance to the present study, particularly in relation to the message concept and in the spelling test. (See Chapter 6 for further development of this).

4.9.4 Missing data in this study

Two types of missing data exist in this study. The first relates to the absence of some children on some occasions, and the second to non-response, particularly in relation to the message concept and the spelling test.

Of the total 186 children in this study, not all children were present on all occasions, and this absence of data required certain decisions to be made in relation to the statistical analyses undertaken. One option would have been to equalise the number of subjects in each cell (approach/sex/cohort). As one of the cells has only 5 subjects, this would have necessitated random selection of five pupils from each of the other cells, leaving only 60 pupils in the final analyses. This equalisation would have had benefits, but would have resulted in wasting a lot of data.

Having considered all of the available options, it was decided that this educational study would be best served by a method of analysis that retained as much of the available data as possible. Consequently, in relation to the inferential statistics, all children who were absent on one or more occasion (from occasion 2 to 9) were excluded from the analysis. This reduced the sample size from 186 to 114 and resulted in unequal numbers of cases in cells. Tabachnik and Fidell (1996) acknowledge that, in non-experimental work, differences in sample size reflect reality and any attempt to produce equality in all cells results in a loss of generalisability, as well as wasting valuable data. Solutions to the problem suggested by Tabachnik and Fidell (1996) have been ratified by Bryman and Cramer (1999) for use with SPSS Version 8. The results presented subsequently are based on the approach suggested by Bryman and Cramer (op cit) as the appropriate solution for the type of data under test. This *unweighted means, regression* or *unique* approach, known as Type II in SPSS, is also appropriate for true experimental design where all cells assume equal importance and where inequality in cells in as a result of random drop-out.

Non-response, on the other hand, was seen to be important, and zero scores or non-response were coded accordingly.

4.9.5 Non-response

In relation to two aspects of the study, non-response is of interest in itself. Children who do not assign a message to their text form an important sub-group, and the relevance of this non-response is discussed in later sections.

In a similar way, a non-response to the spelling test indicated a certain level of performance-related understanding in the child, and this adds a further dimension to the study. Such elements of non-response relate to those children who choose not to write (Sulzby, 1985; section 3.4.2).

4.10 Threats to validity

The main threats to internal and external validity will be considered.

4.10.1 Threats to internal validity

a. History

An unavoidable but arguably major weakness of this study is that during its course the implementation of the National Curriculum resulted in the approaches within each school reflecting the national requirements. In the two "traditional" schools in particular this may have had a direct effect on the type of writing work undertaken, with more of a developmental approach being adopted. Pressure from L.E.A. advisors could also have supported this shift.

One unforeseen complication was that during the study two of the teachers (out of a total of sixteen) enrolled on in-service language courses run at Manchester Metropolitan University, one of which was a ten week course on writing run by the researcher, and this professional development undoubtedly affected the teachers' approach to writing. Such factors need to be made explicit.

b. Instrumentation

The specially developed spelling test, if judged unreliable, would pose a threat to validity. A pilot test was set up to determine reliability.

139

c. Experimental mortality: Population movement

The loss of subjects through drop out in long-running experiments can be a threat to validity in that the residue which stays is likely to be different from the sample group who started the experiment (Cohen and Manion, 1989).

As the study was designed to compare particular relationships between teaching methods and the development of writing and spelling, any child who left the research schools or who was admitted to the schools after the start of the study was excluded from the research. The children who left during the study totalled 31. A table showing the distribution of those leaving by gender and type of instruction is included in Appendix 7. This resulted in a total of 184 children in three sets of schools with initially different approaches to the teaching of writing forming the total population.

d. Selection

Any study which is concentrated in a particular geographical area can potentially suffer from associated weaknesses. Schools of the same group size within a particular Local Education Authority (L.E.A.) are likely to have similar resourcing and funding, and similar access to local courses and advisory staff. The policies which are supported or recommended by the L.E.A. might influence practice. Such regional characteristics might or might not match those of schools in other areas, so applying the results of this study to the broader national picture should be done with due caution.

This study involved 184 pupils. Although this forms a considerable sample size for a longitudinal study, the work would benefit from replication with a larger and more representative samples.

In the initial questionnaire, three terms were defined which formed the basis of the study: traditional, eclectic and developmental. It was recognised both from personal experience and from work such as that of the National Writing Project (1985-88) that approaches to the teaching of writing and spelling within primary schools range along a continuum. The terms were selected to represent the extremes and the mid-point of this continuum. The terms were defined clearly

140

on the original request to schools so that no ambiguity in relation to the terms would exist, but it has to be recognised that interpretation of such terms could be problematic.

This could be true on several levels. Firstly, selection depended upon the perceived approach of the person completing the questionnaire/ ranking scale. As classroom practice is extremely individual, the views of the respondent might not match the perceptions and practice of particular teachers within each school. The number of teachers involved in teaching each class of children during the course of the study eventually turned out to be between four and six. The validity of this categorisation was checked using triangulation, with the class teachers' views as the corroborative evidence.

The work only involved schools which had replied to the questionnaire and which had a written policy on writing and spelling. This selection process was important in terms of the research design, but it must be recognised that the work was focused in schools which demonstrated a high level of interest in language and in language research, both by having a policy and by replying to the questionnaire. Such schools may or may not be typical of the total school population.

It also needs to be noted that the content of the writing policy did not necessarily reflect the individual beliefs of all members of staff within the relevant school. In some instances this was made explicit by the teacher on my visits, either verbally or through observed practice. This mismatch between stated and actual practice, although not widespread, should be taken into account when considering the results.

e. Absence

During the course of the data gathering, several visits were made to each school in each school term. On each occasion there were some children absent from school due to various childhood illnesses, but such absences were deemed to be a normal part of infant schooling and these children were not excluded during the study. Missing data was coded accordingly. A full breakdown

141

of absence on each occasion can be found in Appendix 8.

The total number of children in the study was 186. However, due to absences not all children were present on all occasions (2-9). For this reason, the results will consider either the whole sample of 186 or a specified sub-set of children. The sub-set of children excludes each child who was absent on one or more occasion, and for whom a full set of data cannot be provided. This sub-set numbers 114, and is explained more fully in Chapter 6.

4.10.2 Threats to external validity

a. *Hawthorne Effect*

Although every effort was made to ensure that the data collection represented 'normal' classroom practice, the Hawthorne Effect can affect the results of experiments if and when the subjects realise their role as 'guinea pigs'.

b. *Sensitisation to Experimental Conditions*

The presence of a visitor in school each term can affect the staff's perception of writing, and this could alter practice. Raised awareness of writing might well have been a consequence.

The writing samples were obtained by the researcher who, although a regular visitor to each school over the course of the three year study, was technically an "outsider", not known particularly well by the children. Whilst most children are used to working with a range of adults and do so without this affecting the quality of their work, others are less confident and may not have produced their best quality work for analysis. From informal but systematic discussion with the teachers it would appear that the writing samples were generally representative of the children's usual level of work, with some over achievement balanced by some underachievement.

4.11 The total number of writing samples obtained

On each of the termly visits to schools, the children were asked to write. For the purposes of the study, the writing samples obtained will be

considered as falling in two broad categories. The first is the total number of samples, whilst the second represents those on which closer spelling analysis was possible.

The termly visits to school over three school years resulted in a large number of writing samples being collected. When the children were asked to write, their actual products ranged from mark making and drawings to conventional writing, depending on the children's understanding of the required task and on their conceptual and cognitive development. The total number of such samples is listed in Table 4.11.2. This overall picture of the children's 'writing' therefore includes all of the samples, only some of which were retellings of the story by use of conventional graphemes.

Of this total set of samples, some were classified as conventional writing which communicated an unambiguous message. Once work was classified in this final category, with standard letters used purposefully, it could be coded onto computer for analysis by the CHILDES program.

TABLE 4.11.I TOTAL NUMBER OF WRITING SAMPLES OBTAINED, BY OCCASION AND APPROACH TO INSTRUCTION

OCCASION	TRAD. (n=65)	ECLECTIC (n=64)	D'MENTAL (n=55)	TOTAL SAMPLES
1	24	33	29	86
2	64	58	50	172
3	62	59	54	175
4	64	63	52	179
5	63	52	52	167
6	58	62	50	170
7	62	56	43	161
8	63	62	50	175
9	63	62	48	173

Table 4.11.II shows the number of samples which were conventional, and which were therefore coded onto the CHILDES database.

143

TABLE 4.11.II TOTAL NUMBER OF CHILDES-CODED WRITING SAMPLES BY OCCASION AND APPROACH TO INSTRUCTION

OCC.	TRAD. (n= 65)	ECLECTIC (n= 64)	D'MENTAL (n= 55)	TOTAL SAMPLES
1	9	21	5	35
2	21	16	11	48
3	21	27	14	62
4	43	48	30	121
5	54	48	37	139
6	54	60	44	158
7	60	55	42	157
8	63	62	48	173
9	63	62	48	173
Total	388	399	279	1066

4.12 Outline timetable for the study

Table 4.12.I provides an outline of the study's timescale, and Table 4.12.II relates the data collection to the stated variables.

TABLE 4.12.I CRITICAL PATH ANALYSIS

	AUTUMN TERM	SPRING TERM	SUMMER TERM
1990-91	PhD registration	Permission sought and obtained from LEA to conduct study.	Questionnaire sent to all schools in selected region. Pilot test of spelling completed.
1991-92	6 schools selected/ approached. Visits to obtain writing from Coh. 1.	Visits to obtain writing from Cohorts 1 and 2.	Visits to obtain writing from Cohorts 1 and 2. Spelling test conducted.
1992-93	Visits to schools to obtain writing from Cohorts 1 and 2.	Visits to schools to obtain writing from Cohorts 1 and 2.	Visits to obtain writing from Cohorts 1 and 2. Spelling test conducted.
1993-94	Visits to schools to obtain writing from Cohorts 1 and 2.	Visits to schools to obtain writing from Cohorts 1 and 2.	Visits to obtain writing from Cohorts 1 and 2. Spelling test conducted.
1994-99	Writing up	Writing up	Writing up

TABLE 4.12.II DATA COLLECTION: WHICH DVS WERE ADDRESSED ON EACH OCCASION

	OCC 1	OCC 2	OCC 3	OCC 4	OCC 5	OCC 6	OCC 7	OCC 8	OCC 9
DV 1	X	X	X	X	X	X	X	X	X
DV 2	X	X	X	X	X	X	X	X	X
DV 3	X	X	X	X	X	X	X	X	X
DV 4	X	X	X	X	X	X	X	X	X
DV 5	X	X	X	X	X	X	X	X	X
DV 6			X			X			X

Key:: X = DV addressed on this occasion

DV 1 = the message concept (i.e. whether or not a message
was ascribed to the text)

DV 2 = the total number of words written

DV 3 = the number of different words written

DV 4 = the total number of correctly spelt words written

DV 5 = the number of different correctly spelt words written

DV 6 = the spelling test results.

CHAPTER 5: DESCRIPTION OF THE MEASUREMENT TECHNIQUES

5.1 Assessment procedures

The research focused on a naturalistic approach in that children's unaided writing formed the basis of much of the study. An experimental element, the spelling test, was also included. The strengths and weaknesses of each approach will be considered, and the relevant details of the measurement techniques will be considered.

5.2. The naturalistic element of the research

In order that the children's writing could be studied within the context of their free writing it was decided to concentrate on a naturalistic approach and to obtain one sample of unaided writing from each child during each term of their infant education. In the normal classroom situation teachers make clear their expectations of children with regard to spelling, and these expectations vary considerably. In some classes children are expected to produce correct spellings and are encouraged to ask the teacher to write down any word they do not know for them to copy into their writing. In other classes children are encouraged to experiment, and to use their grapho-phonemic knowledge to attempt a spelling. To allow conclusions to be drawn from the results it was necessary to ensure that the same approach was adopted during the data gathering, regardless of the classroom conventions which usually applied. For this reason the writing samples were obtained in small group situations under the researcher's teaching and supervision. No adult help was given during writing and the children made no reference to word lists or dictionaries. No copying of words was encouraged, and where this did occur, for example when children made use of words written on wall displays, this was noted. For this reason the writing is termed 'unaided'. As the topics for writing were provided, the writing cannot strictly be termed 'free' writing.

146

One key aspect of becoming a writer is the realisation that print can carry a message. The relationship between the children's writing and its intended message, if any, was included as a dependent variable in this study. As each child completed his/her 'writing', s/he was asked by the researcher "Tell me about your writing". This convention was adopted with all children on each occasion where an independent reader could not decipher the text without the writer's help. It was also adopted where any ambiguity existed, for example in relation to word or line breaks or invented spellings which were difficult to read. The children's comments, or their reading of the text, were fully recorded where the text could not 'stand alone', and specific words or phrases were recorded where appropriate. All such messages and details were recorded on the back of each writing sample for reference purposes.

To allow comparison between methods of instruction it was felt important to structure the topic for writing in some way and narrative was chosen, as this is the form of writing most commonly focused upon within the infant phase of education. Writing, as defined in Chapter 3, is a difficult process for young children, and in order that the best possible results were obtained in as relaxed a setting as possible, time was spent in providing an initial stimulus and the opportunity for pre-writing discussion on each occasion. Children could spend as much time as they wished in completing the writing.

5.2.1 The topics for writing

The children were provided with an initial stimulus which consisted of either a reading of the book, followed by a discussion of the storyline and the illustrations, or a telling of the story, using story props such as pictures and dolls, followed by a discussion of the storyline.

The time spent talking about the book or story before writing commenced was seen as vitally important and as central to the writing process. When using the textless books, multiple copies were available for children to look at and refer to during their writing so that the storyline did not have to be committed to memory. When books were used with all text

147

concealed by paper these were books in enlarged format which were easy for the whole group to see. Although none of the classrooms had copies of the actual texts used, these books are readily available and are of the type widely used with the infant age range.

A repetition of the same story on each occasion was considered, as this would have facilitated direct comparisons of vocabulary, story structure and spelling. However, the idea was discarded due to the negative motivational aspect such repetition might have had.

The following table outlines the topic for writing on each occasion.

TABLE 5.2.1 TOPICS FOR WRITING

	Autumn term	Spring term	Summer term
Reception (occasions 1-3)	Autobiographical Writing	The Nest by B. Wildsmith (textless book)	Alex's Bed by M. Dickinson (text concealed)
Year 1 (occasions 4-6)	Little Red Riding Hood (known tale)	The Trunk Wildsmith, B. (textless book)	Katie Morag & the two Grandmothers by M.Hedderwick (text concealed)
Year 2 (occasions 7-9	Goldilocks (known tale)	Sam and the Saucepan by T. Goffe (textless book)	The Three Pigs (known tale)

On several occasions the focus was on a story which was a traditional tale, and therefore known by many of the subjects. This served the added bonus of providing some children with a familiar story structure so the compositional aspect of writing was less demanding than if the storyline had to be totally invented. It was stressed, however, that children did not have to retell the story if they did not wish to do so, although they were encouraged to use the given topic.

It is usual practice in many infant classes for children to write with pencils, and the desire for correctness, in some cases highly stressed by the class teachers, often causes children to erase any errors or first attempts which are judged inaccurate. As this study wanted to preserve all writing

148

efforts it was decided to provide the children with black fibre-tipped pens (Berol Notewriters). Together with the use of coloured A4 paper (with a different colour on each occasion to facilitate record-keeping) this caught the children's interest. Other researchers have found that children respond to the writing instruments they were given and that this can affect performance (Harste, Woodward and Burke, 1984). This use of pens and coloured paper was common to all children on all occasions.

5.2.2 Advantages of the naturalistic approach

One of the strengths of this study is that all spellings were produced by children in situations which required them to use writing for a real purpose within a relaxed, familiar classroom environment. The children were able to choose their own words, within the framework of a suggested story line, rather than words selected by the researcher. The children were not made aware that their spellings would be closely scrutinised, so the writing they produced would be that of any normal classroom situation. Vocabulary selection and spellings were therefore as spontaneous as possible.

5.2.3 Disadvantages of the naturalistic approach

The main disadvantage of the naturalistic approach is that in producing individual unaided writing children will select their own words to represent their thoughts. This is likely to result in each sample containing a different range of vocabulary, so the samples from individual children cannot be directly compared in terms of spelling attainment. Similarly, differences will occur in the volume of writing produced and in the range of words used. Children, if aware of the limitations of their spelling ability, may select words which they feel able to spell, rather than using the vocabulary they would ideally choose.

5.2.4 Preparing the unaided writing for analysis

During the data gathering, the children were asked to write, and the results ranged from drawings to conventional writing, depending on the

149

children's understanding of the required task and on their conceptual and cognitive development. This reflected the findings of Sulzby (1985) who also conducted a study in which children were invited to write stories relating to a specific topic. She found that the children displayed a range of knowledges.

> "They knew that writing is connected to other forms of representation. Some children chose to draw their story, or to talk about writing a story, explaining how they might do it. Other children used writing-like forms such as scribbling or separated curved forms. Others used strings of letters or name elements to stand for their stories. Still others used invented spelling systems, varying from one letter to stand for one syllable, to non- exclusive spelling where one graph may exist simultaneously in two syllables, or exclusive, sequential spellings of the kind Read (1970) and Beers and Henderson (1977) have described. Some vocalised while writing and others did not. A few children used a number of conventional spellings and/or enlisted the examiner as an informant"
> (Sulzby, 1985, p.149)

Not all of the samples collected in this study contained conventional writing which communicated an unambiguous message, so a method of classifying the samples was required which went beyond those adopted in some recent studies. During such studies, particularly those of the Virginia school, all samples which do not communicate an unambiguous message using conventional symbols have been classified as "pre- communicative" (e.g. Gentry, 1981). A further breakdown of the pre- conventional stages in writing was needed by the present study. The researcher separated out the message concept from the classification of writing 'quality', and the two classification systems were as follows.

5.2.5 Classification of marks on the page
The researcher was able to define the physical manifestation of

150

marks on the page in developmental terms, using previous classification systems as a reference point. The original categories were further refined and finally established by examining the actual samples to check that such categories fulfilled the need. The resulting categories were:

drawings only
drawings plus non-conventional symbols/letterlike forms
drawings plus standard letters/numbers used randomly
non-conventional symbols/letterlike forms only
non-conventional symbols/letterlike forms plus some
     standard letters/numbers
standard letters/numbers used randomly
standard letters used purposefully.

This categorisation assumes drawings to be an earlier form of symbolic communication than writing (see Chapter 4) and recognises that children's development of graphemic representation often begins with an experimentation stage when non-standard symbols might be produced. The unconventional symbols are eventually replaced by conventional letters. In addition to learning the formation of the conventional graphemes, the child has to master the exact relationship between grapheme and phoneme, or has to remember the sequences of graphemes in words so that these can be presented meaningfully. What might start out as an apparently random representation finally becomes more explicitly purposeful and increasingly conventional.

The allocation of children's writing to these categories was undertaken by two teachers, giving an inter-rater reliability of 98% on a 10% sample of children's scripts.

Once work was classified in the final category, with standard letters used purposefully, it could be coded onto computer for analysis by the CHILDES program (MacWhinney, 1991).

5.2.6 CHILDES

The Child Language Data Exchange System (CHILDES) consists of

three separate but integrated tools.

CHAT is the transcription and coding format

CLAN is the package of analysis programs and

CHILDES is the database itself.

CHILDES was originally developed at Carnegie Mellon University in 1984, initially under the direction of Brian MacWhinney and Catherine Snow, and was supported by the MacArthur Foundation. The majority of CHILDES data is naturalistic, relating to speech interactions in naturally occurring situations, but in this study those elements of the programs which lend themselves to the transcription of writing were used. This wider use was acknowledged in the manual.

> "Although the tools are of wide applicability, this book concentrates on their use in the child language field, hoping that researchers from other areas can make the necessary analogies to their own topics"
> (MacWhinney, 1991, p.vii).

The standard transcription system for CHILDES is CHAT (Codes for the Human Analysis of Transcripts) and this is designed to facilitate the subsequent automatic analysis of transcripts by a set of computer programs called the CLAN (Computerised Language Analysis) programs. The CLAN programs enable the researcher to perform a large number of automatic analyses of transcript data. The analyses include frequency counts, word searches, mean length of utterance counts, and so on (see Appendix 3 for details). The CHILDES analyses provided more qualitative information than is presented in this study.

In order to enable close analysis of data, writing samples had to be coded onto the computer database following particular conventions. It was decided that three header tiers would be used for transcription. The first of these (*CHI) was a straight transcription of the child's writing, with all non-conventional spellings coded with an asterisk (e.g whent[*]). The next line (%eng) was set up as a text line, directly related to the first *CHI line. This indicated the conventionally spelt intended message. The final line (%err) listed all those words on the *CHI line

152

which had been incorrectly spelt, and therefore asterisked, along with the conventional spelling (e.g. whent=went). A sample of coded text is included in Appendix 5.

5.2.7 Quantitative analysis

The CHILDES analyses were used to generate the number of words each child produced on each occasion in each category as specified by the dependent variables (total number of words written, total number of different words, total number of correctly spelt words, total number of different correctly spelt words). SPSS version 8 was used to generate descriptive and inferential analyses on the data. As outlined in section 4.9.4, only the data relating to those participants who were present on each occasion 2-9 was used, with Type II results presented in relation to inferential analyses.

5.2.8 The message concept

As previously discussed, the presence of the message concept in children's writing was inferred from the children's behaviour where this was not evident from the written evidence. The researcher recorded any intended message which was not obvious from the text. The message concept could thus be considered both in relation to and independently of the writing produced, and the `pre-communicative' category used in earlier studies could be further developed. Both during the writing and upon completion of the task the researcher was able to note any vocalisation or request for help. Each child was asked using an open-ended technique to discuss the finished product, which led many children to read their writing aloud. In the early stages of the research some children had not acquired the message concept, and these children gave the range of responses discussed in Chapter 7. For the purpose of coding the results, children were scored as either providing or not providing a message for the `text', regardless of whether this message was accurately represented by conventional print.

The responses which the children gave were classified as follows

153

No message:

> silence or shake of the head
> "can't write" or "don't know"
> "just letters" or "just writing"
> "can't remember"

Message:

> labelling eg "it's about the bird"
> providing a narrative (one sentence or more).

5.3. The experimental aspect of the research

5.3.1 Advantages of the experimental approach

One major advantage of the experimental approach is that all the target words remain the same over several occasions, giving the researcher full control of one aspect of the children's spelling vocabulary. This facilitates both comparisons over time, and inter- and intra-individual study of the same set of words.

5.3.2 Disadvantages of the experimental approach

A spelling test is not usual practice in infant classrooms, and was not regularly used in any of the schools at the time of this study. Such an approach can be false and threatening for children. The cloze passage (Appendix 9) was devised in an attempt to make the exercise more 'user-friendly' and the atmosphere created aimed to minimise the artificiality of the situation, but it must be accepted that this element of the research did present the children with a difficult task.

5.3.3 The spelling test

In order that some direct comparisons of spelling competence could be made between children, between different approaches to the teaching of writing, and between the same children over time, it was decided to include an experimental element in the study. Having considered available instruments, including normative, criterion referenced and informal tests, it was decided to develop an instrument specifically for this research. A conventional approach

154

to test construction based on statistical item analysis was not adopted, but the validity and reliability of the test were judged through a pilot study (see next section for details). A set of twenty selected words was tested at the end of each school year.

The spelling test element of the research was established to provide the means by which

- the spelling performance of children within the sample could be directly measured and compared, at intra- and inter-individual level, by using the same set of words across three occasions. Each occasion (a to c) represented the end of an academic year

- some examination could be made into whether assembly or retrieval, or a combination of the two, played a significant role in spelling development.

It was important to test the reliability and validity of the spelling test. It was piloted with a class of Year 2 children at a school within the same geographical area but outside the sample of the study during the academic year 1991-1992. (Appendix 6). Twenty six children were given the test on two separate occasions, and the results of these tests were correlated with the results of the National Curriculum S.A.T.s (Standard Assessment Tasks) in reading, spelling and writing.

The following correlations were identified:

total scores - test/ retest reliability:-	.98
regular words total correct:- test/retest	.95
irregular words total correct:- test/retest	.98

Concurrent validity:

total correct occ 1 with SAT reading scores	.93
total correct occ 2 with SAT reading scores	.92
total correct occ 1 with SAT spelling scores	.86
total correct occ 2 with SAT spelling scores	.84
total correct occ 1 with SAT writing scores	.87
total correct occ 2 with SAT writing scores	.85

All correlations are significant at the 1% level.

5.3.3.1 Word selection for the spelling test

Word selection for testing purposes poses a considerable problem. It was decided to use twenty selected words in order to allow sufficient data to be collected yet not to overwhelm the children. This would include ten words which could be defined as following phonically regular spelling patterns and ten which were considered to be irregular. The decision to discriminate between these two categories of words was taken in order to further examine the dual process model of spelling and in particular to consider assembly and retrieval. Regular words can be assembled from grapho-phonic knowledge or retrieved from memory, whereas irregular words must be retrieved from memory, with the writer relying on visual, morphemic and orthographic knowledge in order for the words to be spelt correctly.

Classifying words into phonetically regular and irregular categories within such a complex orthography as English is not a straightforward task. Researchers (e.g. Coltheart et al 1979; Holligan and Johnstone, 1991) have used such classifications as "regular" and "irregular" or "exception" words, but the problem is that regularity is not absolute and is only interpretable in relation to a set of hypothetical rules. By adding to the rules the regularity can change. For the purposes of this study "regular" was taken to refer to the regularity and frequency with which particular graphemes, blends or digraphs matched specific phonemes. Carney (1994) states that, in theory, the alphabetical principle requires that "a given phoneme is represented by a constant symbol, but also that the symbol involved does not represent other phonemes" (Carney, 1994, p.15) and this requirement is known as "biuniqueness". Other researchers define regular words as those whose spelling can be predicted from the sound of the word, given a knowledge of sound-spelling correspondences, and irregular words are defined by exclusion (Sterling, 1992).

As has been previously discussed, English is not a truly alphabetic language, and there is not a consistent phoneme-grapheme relationship.

However, the individual phonemes and graphemes do vary in what Carney terms "their divergence from biuniqueness" (1994, p.15). It is this divergence which leads to the distinction between regular and irregular spellings.

In selecting the words for the spelling test, reference was also made to the work of Venezky (1967) and Hanna et al (1966). In order to achieve further consistency the irregular words were taken from Crystal (1987), who lists some 70 examples of irregular English spellings.

In addition to the regularity of the sound/symbol relationship within the word, the question of word frequency must also be considered. If spelling, and automaticity in spelling, is directly affected by the frequency of use it would be supposed that those words most frequently met in print and used in children's own writing would be the ones correctly spelt. Carney (1994) refers to lexical distribution as the level of incidence with which certain phonemes occur within words

The results will be considered to see if they offer any support for recent theories of spelling such as dual processing.

Having selected the words for the test, it was decided that the children would be asked to write these in a meaningful context rather than in isolation. A cloze passage was designed. This was shown and read to the children so that the task was not dependent on their reading ability (Appendix 9). As with the unaided writing, the spelling task was introduced to small groups of children by the researcher.

A spelling test of this type was not normal practice in some early years' classrooms at the time of this study, and the spellings required posed considerable challenges. For both reasons, any child who showed distress while engaged in this task was treated sympathetically and excused. Some children exercised their right not to write.

157

CHAPTER 6: THE RESULTS OF THE STUDY

6.1 Introduction

This three year longitudinal study was conducted in six schools selected to represent three differing stated approaches to the teaching of writing. Unaided writing samples were obtained from the children on a termly basis and spelling tests were conducted annually. Writing samples were analysed using the CHILDES system.

The total number of children in the study was 186. However, due to absences not all children were present on all occasions (2-9). For this reason, the results will consider either the whole sample of 186 or a specified sub-set of children. The sub-set of children excludes each child who was absent on one or more occasion, and for whom a full set of data cannot be provided. This sub-set numbers 114, and non-bias with respect to sex and method by cohort was confirmed using a Chi-square test (Cohort 1 χ^2=0.042 df=2, p=0.979: Cohort 2 χ^2=1.167, df=2, p=0.558). The matrix in Chart 6.I illustrates the composition of the full attendance sub-set.

TABLE 6.1.I COMPOSITION OF FULL ATTENDANCE SUB-SET (OCCASIONS 2-9)

METHOD	SEX		
	MALE	FEMALE	TOTAL
TRADITIONAL			
Cohort 1	7	8	15
Cohort 2	17	14	31
Total	24	22	46
ECLECTIC			
Cohort 1	10	13	23
Cohort 2	5	8	13
Total	15	21	36
DEVELOPMENTAL			
Cohort 1	7	9	16
Cohort 2	7	9	16
Total	14	18	32
TOTAL	53	61	n = 114

6.2   The Presentation of Results

It is appreciated that statistically non-significant results may be of psychological importance. From the data disk (Appendix 2) and the coding key (Appendix 4) all such scores can be readily calculated. The results presented in this chapter are deliberately restricted to those which it is felt merit close attention. This involves both descriptive and inferential statistics.

The first part of the chapter will consider the variables and the hypotheses. The message concept (DV 1) will be considered in Section 6.3 and will be examined using one way analysis of variance. Section 6.4 will examine DVs 2 to 5 through descriptive statistics and   factorial ANOVAs. DV 6   (the spelling test results) will be presented in Section 6.5 using descriptive statistics, ANOVAS and correlations.

The final parts of the chapter will present some of the results derived from close analysis of children's spelling using the CHILDES programs.

6.3   The Message Concept (DV 1)

The results for the message concept use the total sample and occasions 2 to 9, as Cohort 2 was not present on occasion 1.

The message concept has been identified as one of a series of concepts relating to print which it is necessary for children to develop in becoming literate (Clay, 1975; Dyson, 1985,1994). However, as discussed in previous chapters, few studies have focused on this aspect of writing. During this research the importance of the verbal message and its relationship with the permanent writing was recognised and was part of the research intention. As the researcher was with each child as the writing was undertaken, it was possible to record

      a) whether or not a message was offered (see 5.2.7)

      b) what the message was, and

      c) how the given message related to the graphemic symbols on
          the page.

This study therefore interprets 'message' to mean the desire or intention to communicate rather than the ability to produce a piece of writing which can be interpreted by a reader who is not in direct oral contact with the writer. The child's expressive language was taken to infer the existence or non-existence of the message concept where the text alone did not communicate an unambiguous message (see 4.7.1).

Within this interpretation of communicating a message, a child may set out to convey a predetermined message, or may make marks (drawing or graphemic) and later ascribe a message to these marks. A message can also, therefore, be related to each or any of the stages from drawing to conventional writing, so can be considered independently of accuracy in writing. It must be recognised that regression may occur due to different physical and cognitive demands faced by writers at different stages of development.

In some respects this aspect of the research has a binary outcome, either a message is ascribed or is not ascribed, but this simplicity masks the nature of the message's relationship with the offered text which in reality is far more complex (see Chapter 7 for discussion).

In relation to DV1, the message concept, each sample of writing was either ascribed a message by the child, or it was not. The occasion on which the message concept appeared to become established was judged according to that occasion (2 - 9) when a message was ascribed, and on no subsequent occasion a message was not ascribed. This resulted in each child being allocated a numerical rating from 2 to 9. A one way analysis of variance was then carried out.

A key concern of this aspect of the study is the change across occasions. The first chart presents the total number and percentage of children seen on each occasion according to whether or not a message was allocated to the text. Following that, each of three independent variables - approach, sex and cohort - will be considered in relation to the occasion on which the message concept was developed. The total number of children was 186, and the variations from this total indicate absences due to ill health.

TABLE 6.3.I PERCENTAGE OF CHILDREN PROVIDING A MESSAGE ON OCCASIONS 2-9

	OCCASION							
	2	3	4	5	6	7	8	9
Total Population	172	175	179	167	170	161	175	173
% giving a message	72	69	93	97	96	100	99	100

The results show that the majority of children have grasped the message concept during the Reception year (occasions 2 and 3). By the end of Year 1 (occasions 4-6) this aspect of writing is understood by almost all of the children.

6.3.1 Message concept by approach (IV1 x DV1)

It was hypothesised (Hi1) that there would be a significant difference between the occasion on which the message concept was established between the children being taught by traditional, eclectic or developmental approaches. The results show that the null hypothesis is not rejected. There is no significant difference between the different approaches in relation to the occasion of testing when the message concept was established ($F_{(2,181)}$ 0.45; p=0.64).

6.3.2 Message concept by sex (IV2 x DV1)

It was hypothesised (Hi2, IV sex) that there would be a significant difference between boys and girls in relation to the occasion on which the message concept was established. The null hypothesis is not rejected. There is no significant difference between male and female in relation to the occasion of testing when the message concept was established.

However, although the F ratio is not statistically significant, ($F_{(1,184)}$ 2.90; p=0.09), the actual occasion (from 2 to 9) on which the message concept is established is of pedagogical significance, showing that girls acquire the message concept earlier than boys. The results in Table 6.3.II are presented to illustrate this difference.

161

TABLE 6.3.II   MESSAGE CONCEPT BY SEX

	NUMBER OF CHILDREN	OCCASION	STANDARD DEVIATION
Male (n=53)	90	3.02	1.74
Female (n=61)	94	2.62	1.49
	184	2.82	1.61

6.3.3   Message concept by cohort (IV3 x DV1)

It was hypothesised (Hi3, IV3 cohort) that there would be a significant difference between the children in Cohort 1 and Cohort 2 in relation to the occasion on which the message concept was established. The null hypothesis is rejected. There is a significant difference ($F_{(1,183)}$12.96; p=0.004) between Cohort 1 and Cohort 2 in relation to the occasion of testing when the message concept was established.

A closer examination of the two cohorts shows that the children in both cohorts have generally achieved the message concept before the end of their first year in school. For cohort 1, who started school in September, the mean is 2.39, and for cohort 2 with a January admission date the mean is 3.22.

TABLE 6.3.III   MESSAGE CONCEPT BY COHORT

	NUMBER OF CHILDREN	OCCASION	STANDARD DEVIATION
COHORT 1(n=54)	90	2.39	1.80
COHORT 2 (n=60)	94	3.22	1.32
	184	2.82	1.62

The results show that the message concept is not understood by all children during the Reception year, but has generally developed in children after one year of formal schooling.

TABLE 6.3.IV SUMMARY OF INFERENTIAL STATISTICS FOR MESSAGE CONCEPT

	IV1 APPROACH	IV 2 SEX	IV 3 COHORT
BETWEEN GROUP SCORES	No significant difference	No significant difference	Significant difference: Cohort 1 developed significantly earlier

In relation to the message concept, a significant difference is evident between the two cohorts, but analysis by approach and sex shows no statistical difference.

6.4 Dependent variables 2-5

6.4.1 An overview

Four measures of children's word production were considered in the study:

- ♦ DV 2 - the total number of words produced in the writing sample
- ♦ DV 3 - the number of different words written
- ♦ DV 4 - the total number of correctly spelt words written
- ♦ DV 5 - the number of different correctly spelt words written.

The total number of words and the total number of correctly spelt words were considered to be useful indicators of the amount of writing undertaken by the children. As certain words are used frequently in English, the number of different words written by each child was considered to give a helpful indication of the child's writing vocabulary, and the number of different correctly spelt words was taken to give a measure of each child's ability to spell conventionally.

These results will consider the sub-set of children (n=114) who were present on each occasion 2-9.

This study aimed to monitor the development of conventional spelling in children's unaided writing, and to consider whether the approach to the teaching of writing influenced spelling development.

The non-directional null hypotheses suggested that there would be

163

no real difference between the mean scores

- for children in schools adopting different approaches to the teaching of writing
- for boys and girls
- for the two cohorts
- for mean scores on different occasions
- and there would be no real interaction between any combination of the independent variables in relation to the mean scores on any of the dependent variables

With regard to the dependent variables 2-5, each writing sample was analysed to provide mean scores for each individual child. The mean scores and standard deviations for each of the DVs 2-5 were calculated for each occasion (2-9) for all those children in the full attendance sub-set (n=114). (In this section, summary data are provided where appropriate. Further details can be computed using the coding key and data disks in the appendices or see Appendix 16). A series of four-way multiple analysis of variance with repeated measures was carried out for each dependent variable. These will be considered in turn in sections 6.4.3-6.4.6.

6.4.2 Descriptive statistics

The following graph plots the mean scores on DVs 2-5 for the full attendance subset (n=114). The mean number of total words written increases by occasion. One exception to this is that between occasions 7 and 8 (between mid-term in the autumn term of Year 2 and mid-term in the spring), when the total number of words and the total number of different words written by children do not make the expected mean progress.

Trend of the 4 D.V.s across occasions 2-9 for the whole sample
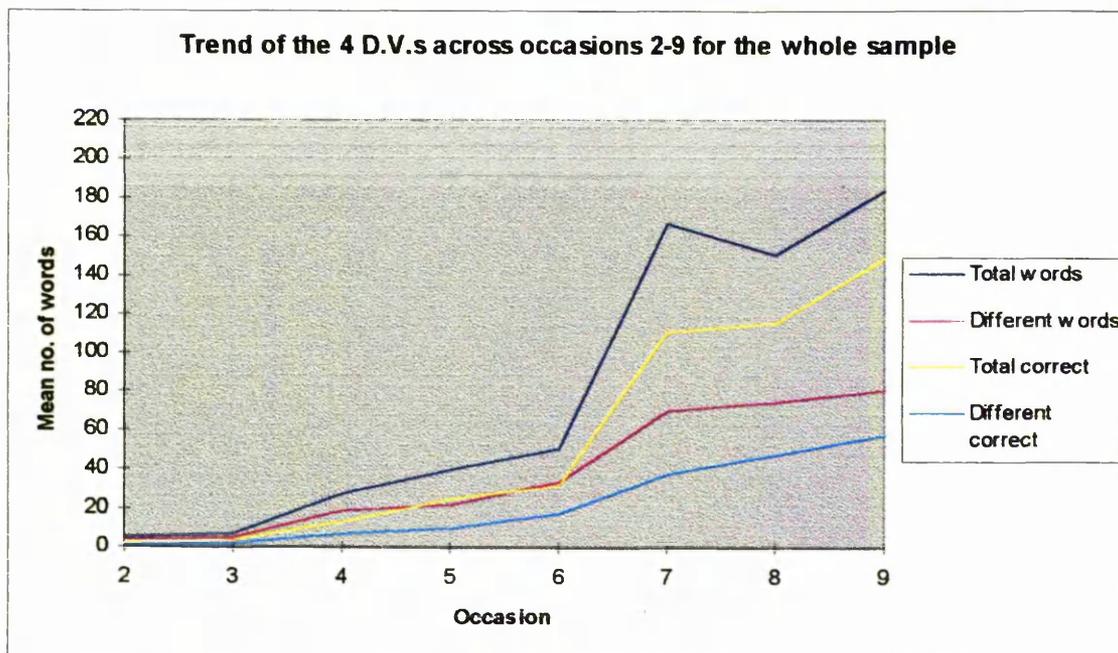
GRAPH 6.4.1 TREND OF DVS 2-5 ACROSS OCCASIONS FOR WHOLE SAMPLE (N=114)

There are two aspects of this graph which should be noted. Firstly, there are two periods of time when the mean number of total words and the mean number of total correctly spelt words written increase noticeably, and these are between occasions 3 and 4, and 6 and 7. Secondly, the dependent variables recorded on the graph show some patterning. The means of the total number of words (DV2) and the means of the total number of correctly spelt words (DV4) follow a similar trend, while the means of the total number of different words used (DV3) and the means of the total number of different correctly spelt words (DV5) also share a similar pattern.

It would appear that there is a proportional relationship between the total number of words written and the total number of different words produced by all children, and a similar relationship between the total number of correctly spelt words written and the number of different correctly spelt words. The correlations between the variables were examined. When the Pearson test was applied to the dependent variables on occasions 2 and 9, the following results were obtained.

165

TABLE 6.4.II INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 2

	DV 3	DV 4	DV 5
DV 2	0.976**	0.912**	0.931**
DV 3		0.817**	0.871**
DV 4			0.975**

**p<0.01

TABLE 6.4.III INTER- CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 9 (N=114)

	DV 3	DV 4	DV 5
DV 2	.949**	.971**	.863**
DV 3		.901**	.859**
DV 4			.938**
DV 5			

**p<0.01

For the purposes of exemplification, only the scores for occasions 2 and 9 are presented here. Correlation matrices were produced for each occasion for the whole sample, by approach, by sex and by cohort. An inspection of these patterns of inter-correlations indicated that the returns from carrying out inferential analyses of (i) the significance of differences between correlations on a given occasion and (ii) the significance of the degree of correlation between all occasions were less central to the present study than the changes in mean scores. An interesting point is that all correlations were highly significant. (see Appendix 10 for 32 correlation matrices).

6.4.3 Total number of words written (DV2)

In order to test the hypotheses Ho1 (approach) Ho2 (sex) and Ho3 (cohort) in relation to DV2, a mixed design factorial ANOVA was conducted, using the category of total number of words written as the dependent variable. The scores for individual children across occasions 2-9 formed the within subjects repeated measure, and the independent variables IV1-3 formed the between subjects measures This tested for:

a) differences between occasion (within subject variable)

b) differences between cohort 1 and cohort 2

c) differences between those children taught by traditional, eclectic and developmental approaches

d) differences between males and females

e) the presence of interaction between these variables.

The results of this analysis are presented in Table 6.4.IV.

TABLE 6.4.IV MIXED DESIGN FACTORIAL ANOVA, TAKING THE TOTAL NUMBER OF WORDS WRITTEN AS THE DEPENDENT VARIABLE

	F		SIGNIFICANCE
OCCASION x APPROACH x COHORT x SEX	$F_{(3,110)}$	0.64	p=0.53
OCCASION x COHORT x APPROACH	$F_{(2,111)}$	3.40	p=0.04*
OCCASION x COHORT x SEX	$F_{(2,111)}$	0.22	p=0.64
OCCASION x APPROACH x SEX	$F_{(2,111)}$	0.83	p=0.44
COHORT x APPROACH x SEX	$F_{(2,111)}$	0.44	p=0.65
OCCASION x COHORT	$F_{(1,112)}$	5.10	p=0.03*
OCCASION x APPROACH	$F_{(2,111)}$	3.67	p=0.03*
OCCASION x SEX	$F_{(1,112)}$	2.60	p=0.11
COHORT x APPROACH	$F_{(2,111)}$	4.95	p=0.01**
COHORT x SEX	$F_{(1,112)}$	0.36	p=0.55
APPROACH x SEX	$F_{(2,111)}$	0.37	p=0.69
OCCASION	$F_{(1,112)}$	498.25	p=0.00**
COHORT	$F_{(1,112)}$	9.12	p=0.00**
APPROACH	$F_{(2,111)}$	1.93	p=0.15
SEX	$F_{(1,112)}$	2.43	p=0.12

*p=<0.5   ** p<0.01

TABLE 6.4.V MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT x APPROACH FOR DV2

	T1 (n=15)	T2 (n=31)	E1 (n=23)	E2 (n=13)	D1 (n=16)	D2 (n=16)
Occ 2	11.4(19.3)	2.4(5.5)	8.0(10.0)	1.5(3.6)	7.0(11.4)	1.4(4.2)
Occ 3	18.2(37.6)	1.7(4.0)	10.6(9.9)	3.0(9.4)	5.6(9.2)	2.9(6.6)
Occ 4	50.1(56.3)	15.0(17.1)	45.2(45.5)	11.5(11.8)	17.1(16.6)	29.3(33.1)
Occ 5	62.8(24.5)	32.8(20.0)	41.6(17.2)	37.9(24.6)	37.1(46.3)	38.1(24.2)
Occ 6	78.9(42.9)	35.4(19.8)	56.4(34.0)	35.9(23.4)	47.6(57.1)	65.3(52.4)
Occ 7	207.6(88.9)	132 (100.9)	61.1(85.8)	140.2(85.2)	176.1(98.8)	215.2(126.2)
Occ 8	196.1(99.9)	127.7(75.2)	49.0(59.7)	111.7(55.7)	166.6(92.6)	171.7(82.4)
Occ 9	288.5(157.8)	160.6(68.3)	70.1(84.2)	132.8(84.4)	84.8(113.5)	191.8(124.7)

TABLE 6.4.VI MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT FOR DV2

	Cohort 1 (n=54)	Cohort 2 (n=60)
Occ 2	8.7(13.4)	1.9(4.8)
Occ 3	11.2(21.5)	2.3(6.1)
Occ 4	38.2(44.4)	18.122.5)
Occ 5	46.1(31.7)	35.3(22.0)
Occ 6	60.1(45.2)	43.5(34.4)
Occ 7	178.4(91.0)	156.0(109.6)
Occ 8	167.383.2)	136.0(75.8)
Occ 9	207.4(125.6)	162.9(90.6)

TABLE 6.4.VII MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x APPROACH FOR DV2

	Traditional (n=46)	Eclectic (n=36)	D'mental (n=32)
Occ 2	5.3(12.5)	5.7(8.8)	4.2(8.9)
Occ 3	7.1(22.6)	7.8(10.3)	4.2(8.0)
Occ 4	26.5(38.2)	33.0(40.2)	23.2(26.5)
Occ 5	42.6(25.6)	40.2(19.9)	37.6(36.4)
Occ 6	49.6(35.5)	49.0(31.8)	56.4(54.6)
Occ 7	156.6(102.6)	153.6(85.0)	195.6(113.3)
Occ 8	150.0(89.0)	135.6(60.3)	169.2(86.3)
Occ 9	202.3(120.5)	156.6(85.0)	188.3(117.4)

The null hypotheses relating to occasion, cohort and interaction are rejected in relation to DV2. The independent variables of occasion and cohort were statistically significant as main effects and in interaction with other variables. As a main effect, the null hypothesis relating to approach is not rejected in relation to DV2. However, this variable was statistically significant in interaction with other variables. As a main effect, the null hypothesis relating to sex is not rejected on relation to DV2.

Although only significant at the 5% level, a second order interaction exists between occasion x cohort x approach.

The significant effect for cohort by approach is also noteworthy. When the interaction between cohort and approach is considered in greater detail, this relationship between the cohorts is seen to be more complex. Table 6.4.2 shows that the January cohort out-performs the September cohort in total word production within the schools professing a developmental approach, whereas the September cohort outperforms the January cohort for the other two approaches.

GRAPH 6.4.8 INTERACTION OF COHORT BY METHOD FOR TOTAL WORDS PRODUCED

Interaction of cohort by method for total word (averaged across occasions 2-9)
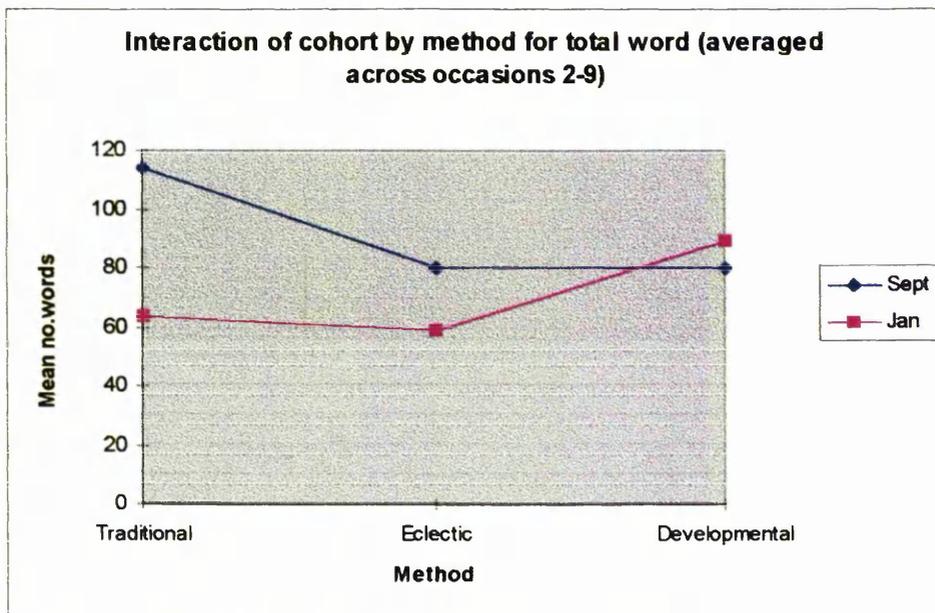
(an interaction is defined statistically as equivalent to stating that the lines of mean scores cannot be said to be parallel within the limits of random variation)

The results show that there was a significant effect for cohort (i.e. there was a significant difference between the mean number of total words written between children in cohort 1 and cohort 2, with cohort 1 having higher mean scores). As the children in cohort 2 are the younger children in the classes, and have had one term less in formal education, this is hardly surprising. However, all children are assessed using the same measures at the end of key stage 1 regardless of age, so this difference is of pedagogical interest and is worthy of note.

There were statistically significant main effects for occasion (p<0.01) and for cohort (p<0.01) in relation to the total number of words written by children.

The differences between the means for each successive pair of occasions were computed, and the statistical significance of these is shown in the following table.

TABLE 6.4.IX   DIFFERENCE BETWEEN MEANS ON SUCCESSIVE OCCASIONS IN RELATION TO DV2 (TOTAL WORDS)

	3	4	5	6	7	8	9
2	+1.4**						
3		+21.1**					
4			+12.8*				
5				+10.9			
6					+115**		
7						-15.8	
8							+33.1**

**p<0.01

With regard to the total number of words written, the difference in means between different occasions shows that development is incremental, apart from the reduction in means between occasions 7 and 8. When these results are considered in relation to the location of occasions it can be seen that statistically significant increases occur during the reception year, and between summer and autumn in each year of testing.

Reception	Occ 1 Autumn term	Occ 2 spring term	Occ 3 Summer term
Year 1	Occ 4 Autumn term	Occ 5 spring term	Occ 6 summer term
Year 2	Occ 7 Autumn term	Occ 8 spring term	Occ 9 Summer term

6.4.4 Total number of different words written (DV3)

The total number of different words written was considered to be a useful indicator of children's writing vocabulary. The repetitions of words, including high frequency words were excluded from this analysis.

A mixed design factorial ANOVA was conducted, using the category of total number of different words written as the dependent variable. The scores for individual children across occasions 2-9 formed the within subjects measure, and the independent variables IV1-3 formed the between subjects measures. This tested for:

a) differences between occasion (within subject variable)

b) differences between cohort 1 and cohort 2

c) differences between those children taught by traditional, eclectic and developmental approaches

d) differences between males and females

e) the presence of interaction between these variables.

The results of this analysis are presented in the following table.

TABLE 6.4.X MIXED DESIGN FACTORIAL ANOVA, TAKING THE TOTAL NUMBER OF DIFFERENT WORDS WRITTEN AS THE DEPENDENT VARIABLE.

	F		Significance
OCC x COHORT x APPROACH x SEX	$F_{(2,111)}$	2.73	p=0.07
OCC x COHORT x APPROACH	$F_{(2,111)}$	3.61	p=0.03*
OCC x COHORT x SEX	$F_{(2,111)}$	1.71	p=0.19
OCC x APPROACH x SEX	$F_{(2,111)}$	0.78	p=0.46
COHORT x APPROACH x SEX	$F_{(2,111)}$	1.54	p=0.13
OCCASION x COHORT	$F_{(1,112)}$	1.26	p=0.26
OCCASION x APPROACH	$F_{(2,111)}$	5.08	p=0.01**
OCCASION x SEX	$F_{(1,112)}$	4.38	p=0.04*
COHORT x APPROACH	$F_{(2,111)}$	5.66	p=0.01**
COHORT x SEX	$F_{(1,112)}$	1.95	p=0.17
APPROACH x SEX	$F_{(2,111)}$	0.28	p=0.75
OCCASION	$F_{(1,112)}$	1049.02	p=0.00**
COHORT	$F_{(1,112)}$	8.57	p=0.00**
APPROACH	$F_{(2,111)}$	1.86	p=0.16
SEX	$F_{(1,112)}$	0.09	p=0.80

*p<0.05   ** p<0.01

TABLE 6.4.XI MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT x APPROACH FOR DV3

	T1(15)	T2(31)	E1(23)	E2(13)	D1(16)	D2(16)
Occ 2	7.6(10.7)	1.9(4.1)	6.1(7.4)	1.2(3.1)	5.7(9.2)	1.4(4.2)
Occ 3	10.9(16.6)	1.5(3.3)	9.1(7.9)	2.2(6.4)	4.9(8.1)	2.4(5.4)
Occ 4	28.6(23.1)	12.4(12.5)	28.2(23.0)	9.4(8.1)	14.3(13.2)	21.0(21.1)
Occ 5	46.9(19.3)	18.3(9.2)	23.1(7.7)	20.5(12.4)	19.1(19.4)	21.3(12.1)
Occ 6	46.9(19.3)	25.8(12.3)	36.2(17.9)	24.7(13.9)	30.3(29.2)	42.7(27.5)
Occ 7	80.1(23.1)	60.5(31.2)	66.4(21.5)	63.5(30.7)	71.1(28.2)	85.9(34.0)
Occ 8	93.8(42.0)	67.7(29.5)	73.1(20.5)	57.0(23.2)	81.6(36.4	85.0(28.1)
Occ 9	88.5(157.8)	75.7(21.7)	75.9(26.6)	67.3(31.5)	78.5(32.9)	88.1(37.1)

TABLE 6.4.XII MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x APPROACH FOR DV3

	Traditional (n=46)	Eclectic (n=36)	D'mental (n=32)
Occ 2	3.7(7.4)	4.3(6.6)	3.5(7.4)
Occ 3	4.6(10.6)	6.6(8.1)	3.7(6.9)
Occ 4	17.7(18.1)	21.4(21.0)	17.7(17.6)
Occ 5	23.2(12.1)	22.1(9.6)	20.2(16.0)
Occ 6	32.7(17.8)	32.1(17.3)	36.5(28.6)
Occ 7	66.9(30.0)	65.4(24.8)	78.5(31.6)
Occ 8	76.2(35.8)	67.3(22.6)	83.3(32.0)
Occ 9	87.0(35.4)	72.8(28.4)	83.2(34.8)

The null hypotheses relating to occasion, cohort and interaction are rejected in relation to DV3. The independent variables of occasion and cohort were statistically significant as main effects and in interaction with other variables. As a main effect, the null hypothesis relating to approach is not rejected in relation to DV3. However, this variable was statistically significant in interaction with other variables. As a main effect, the null hypothesis relating to sex is not rejected on relation to DV3.

The interaction between cohort x approach is significant at the 1% level. The following graph shows the nature of this interaction. The second cohort outperforms the first in those schools professing a developmental approach to writing, in relation to the number of different words used, whereas Cohort 1 performs better in the other two approaches.
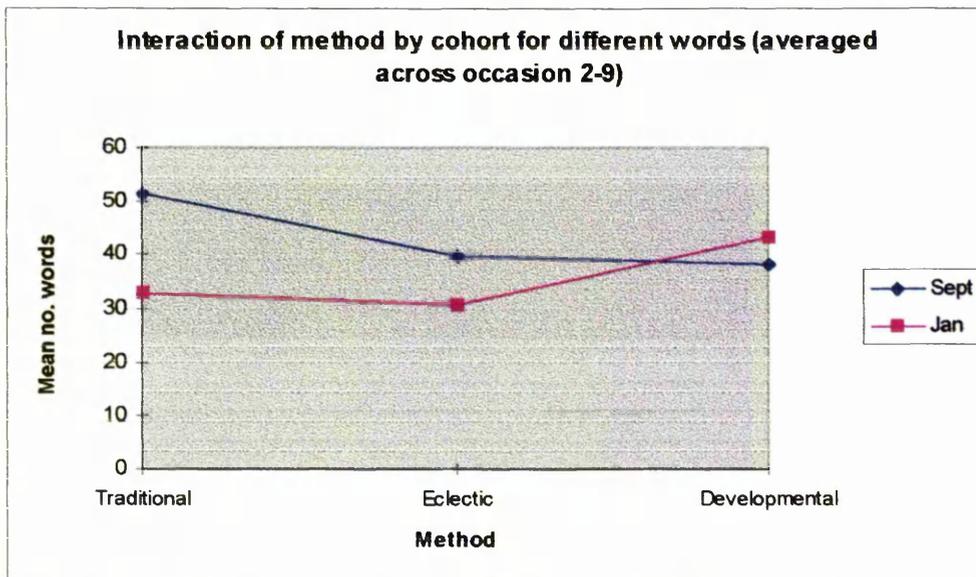
GRAPH 6.4.13 INTERACTION OF COHORT BY APPROACH FOR DIFFERENT WORDS (DV3)

Again, occasion proves to be highly significant. With regard to the number of different words written, occasion *x* approach is also highly significant, and occasion *x* sex is significant at the 5% level.

When the difference between means is considered across occasions in relation to the total number of different words used, the results show a different pattern from that noted in relation to DV2. The increase between means over successive occasions is highly significant, apart from the last occasion of testing.

TABLE 6.4.XIV DIFFERENCE BETWEEN MEANS ON SUCCESSIVE OCCASIONS IN RELATION TO DV3 (TOTAL NUMBER OF DIFFERENT WORDS)

	3	4	5	6	7	8	9
2	+1.1**						
3		+13.9**					
4			+3.2**				
5				+11.5**			
6					+36.1**		
7						+5.7**	
8							+6.1

**p<0.01

6.4.5 Total number of correctly spelt words (DV4)

The total number of correctly spelt words, which includes all repetitions of words, gives a useful measure of each child's ability to spell conventionally.

A mixed design factorial ANOVA was conducted, using the category of total number of correctly spelt words written as the dependent variable. The scores for individual children across occasions 2-9 formed the within subjects measure, and the independent variables IV1-3 formed the between subjects measures. This tested for:

a) differences between occasion (within subject variable)

b) differences between cohort 1 and cohort 2

c) differences between those children taught by traditional, eclectic and developmental approaches

173

c) differences between those children taught by traditional, eclectic and developmental approaches

d) differences between males and females

e) the presence of interaction between these variables.

The results of this analysis are presented in Table 6.4.XV

TABLE 6.4.XV   MIXED DESIGN FACTORIAL ANOVA, TAKING THE TOTAL NUMBER OF CORRECTLY SPELT WORDS AS THE DEPENDENT VARIABLE

	F		Significance
OCCASION x APPROACH x SEX x COHORT	$F_{(2,111)}$	0.11	p=0.90
OCC x COHORT x APPROACH	$F_{(2,111)}$	4.41	p=0.02*
OCC x COHORT x SEX	$F_{(1,112)}$	0.53	p=0.47
OCC x APPROACH x SEX	$F_{(1,112)}$	1.06	p=0.35
COHORT x APPROACH x SEX	$F_{(2,111)}$	0.38	p=0.68
OCCASION x COHORT	$F_{(1,112)}$	7.23	p=0.01**
OCCASION x APPROACH	$F_{(2,111)}$	2.93	p=0.06*
OCCASION x SEX	$F_{(1,112)}$	1.14	p=0.29
COHORT x APPROACH	$F_{(2,111)}$	5.57	p=0.01**
COHORT x SEX	$F_{(1,112)}$	0.56	p=0.45
APPROACH x SEX	$F_{(2,111)}$	0.56	p=0.55
OCCASION	$F_{(1,112)}$	328.61	p=0.00**
COHORT	$F_{(1,112)}$	10.35	p=0.00**
APPROACH	$F_{(2,111)}$	2.15	p=0.12
SEX	$F_{(1,112)}$	0.80	p=0.37

*p<0.05   ** p<0.01

TABLE 6.4.XVI   MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT x APPROACH FOR DV4

	T1(15)	T2(31)	E1(23)	E2(13)	D1(16)	D2(16)
Occ 2	7.5(16.4)	0.9(2.1)	3.2(4.9)	0.2(0.3)	2.4(4.2)	0.2(0.8)
Occ 3	12.7(30.7)	0.8(2.2)	5.2(5.5)	2.2(7.5)	2.4(4.0)	1.4(3.5)
Occ 4	34.7(52.8)	5.5(8.1)	20.3(22.1)	3.8(4.8)	6.6(8.5)	10.6(15.6)
Occ 5	43.5(24.6)	17.7(12.9)	26.7(13.5)	22.2(16.0)	23.8(37.8)	21.9(17.0)
Occ 6	58.2(42.3)	19.1(12.4)	36.7(27.1)	19.1(15.5)	29.6(48.7)	36.8(40.7)
Occ 7	168.5(84.4)	84.8(82.1)	114.9(77.2)	83.7(56.7)	101.3(77.8)	136.2(115.6)
Occ 8	172.3(102)	96.0(62.6)	117.1(57.4)	81.3(42.7)	116.9(82.8)	128.9(72.3)
Occ 9	255.1(141.4)	126.1(62.6)	138.7(83.1)	101.4(72.6)	142.4(118.3)	152.3(117.7)

TABLE 6.4.XVII   MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT FOR DV4

	Cohort 1	Cohort 2

TABLE 6.4.XVIII MEAN AND STANDARD DEVIATION SCORES FOR OCCASION _x_ APPROACH FOR DV4

	Traditional (n=46)	Eclectic (n=36)	D'mental (n=32)
Occ 2	3.0(9.8)	2.1(4.2)	1.3(3.2)
Occ 3	4.7(18.1)	4.1(6.4)	1.9(3.8)
Occ 4	15.0(33.2)	14.4(19.4)	8.6(12.5)
Occ 5	26.1(21.17)	25.1(14.4)	22.9(28.8)
Occ 6	31.8(31.7)	30.3(24.9)	33.2(44.3)
Occ 7	112.1(91.0)	103.6(71.3)	118.7(98.5)
Occ 8	120.8(84.6)	104.2(54.8)	122.9(76.8)
Occ 9	168.2(112.1)	125.3(80.5)	147.3(116.2)

The null hypotheses relating to occasion, cohort, approach and interaction are rejected in relation to DV4. The independent variables of occasion and cohort were statistically significant as main effects and in interaction with other variables. As a main effect, the null hypothesis relating to approach is not rejected in relation to DV4. However, the variable was statistically significant in interaction with other variables. As a main effect, the null hypothesis relating to sex is not rejected on relation to DV4

The interaction between cohort and approach is detailed in the following graph. Once again, this interaction concerns the second cohort in developmental schools, with the January cohort outperforming the September cohort in relation to the total number of correctly spelt words. In schools professing the other two approaches, the September cohort performs better.

Interaction of method by cohort for total correct words (averaged across occasions 2-9)
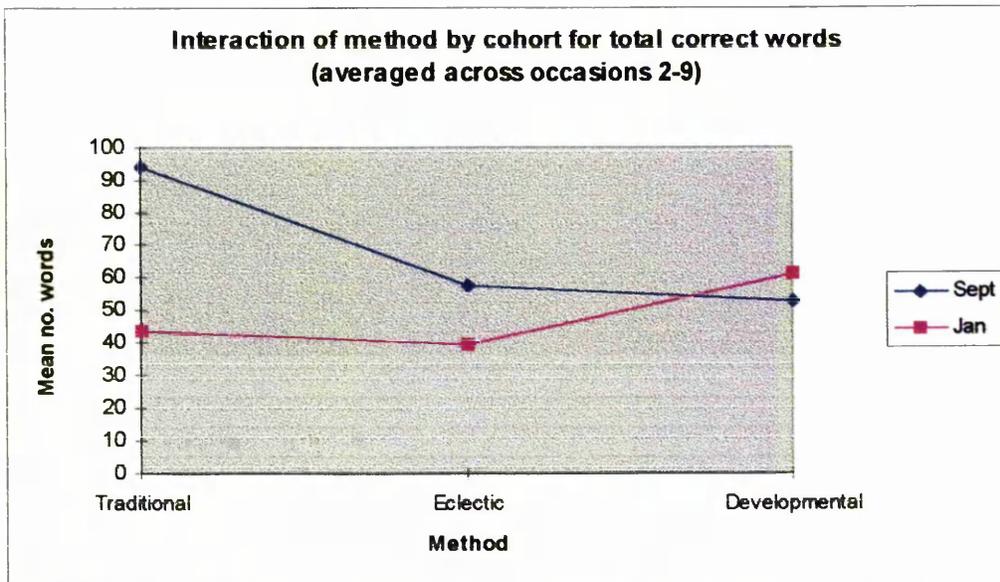
GRAPH 6.4.19 INTERACTION OF COHORT BY APPROACH IN RELATION TO TOTAL NUMBER OF CORRECTLY SPELT WORDS (DV4)

As with the two previous analyses of DV2 and DV3, occasion proves highly significant.   Again, as with the previous two analyses, cohort and cohort by approach are significant at the 1% level, and in relation to DV4 occasion by cohort is also significant at the 1% level. Occasion x approach, and occasion x cohort x approach are both significant at the 5% level.

When the mean total number of correctly spelt words is considered, a different pattern emerges from the other DVs. Those periods during which statistically significant increases in means occur are fewer, and the difference between occasions 3 and 4, 6 and 7, and 7 and 8 are key. The first of these two periods include the summer holidays. Between 7 and 8 the overall number of words written showed a reduction, whilst the number of correctly spelt words showed a significant increase.

TABLE 6.4.XX DIFFERENCE BETWEEN MEANS ON SUCCESSIVE OCCASIONS IN RELATION TO DV4 (TOTAL NUMBER OF CORRECT WORDS)

	3	4	5	6	7	8	9
2	+1.5*						
3		+9.3**					
4			+11.9				
5				+6.9			
6					+79.5**		
7						+4.9**	
8							+32.6*

**p<0.01

6.4.6   Total number of different correctly spelt words (DV5)

The total number of different correctly spelt words represents, in this study, each individual's ability to spell conventionally. Repetitions are excluded from this count.

A mixed design factorial ANOVA was conducted, using the category of total number of different correctly spelt words written as the dependent variable. The scores for individual children across occasions 2-9 formed the within subjects measure, and the independent variables IV1-3 formed the between subjects measures. This tested for:

a) differences between cohort 1 and cohort 2

b) differences between those children taught by traditional,

   eclectic and developmental approaches

c) differences between males and females

d) the presence of interaction between these variables.

The results of this analysis are presented in Table 6.4.XXI.

TABLE 6.4.XXI MIXED DESIGN FACTORIAL ANOVA, TAKING THE TOTAL NUMBER OF DIFFERENT CORRECTLY SPELT WORDS AS THE DEPENDENT VARIABLE

	F		Significance
OCCASION x APPROACH x SEX x COHORT	$F_{(1,112)}$	0.25	p=0.78
OCC x COHORT x APPROACH	$F_{(2,111)}$	5.10	p=0.00**
OCC x COHORT x SEX	$F_{(1,112)}$	1.15	p=0.29
OCC x APPROACH x SEX	$F_{(1,112)}$	1.72	p=0.18
COHORT x APPROACH x SEX	$F_{(2,111)}$	0.65	p=0.52
OCCASION x COHORT	$F_{(1,112)}$	8.79	p=0.00**
OCCASION x APPROACH	$F_{(2,111)}$	4.14	p=0.02*
OCCASION x SEX	$F_{(1,112)}$	0.93	p=0.34
COHORT x APPROACH	$F_{(2,111)}$	6.10	p=0.00**
COHORT x SEX	$F_{(1,112)}$	1.28	p=0.26
APPROACH x SEX	$F_{(2,111)}$	1.26	p=0.29
OCCASION	$F_{(1,112)}$	327.58	p=0.00**
COHORT	$F_{(1,112)}$	12.30	p=0.00**
APPROACH	$F_{(2,111)}$	3.46	p=0.04*
SEX	$F_{(1,112)}$	0.60	p=0.44

*p<0.05   **p<0.01

TABLE 6.4.XXII MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT x APPROACH FOR DV5

	T1(15)	T2(31)	E1(23)	E2(13)	D1(16)	D2(16)
Occ 2	4.3(8.0)	0.6(1.3)	2.0(3.1)	0.2(0.3)	1.7(3.0)	0.2(0.8)
Occ 3	6.5(11.9)	0.6(1.7)	4.2(4.2)	1.3(4.4)	2.0(3.4)	1.0(2.3)
Occ 4	16.5(20.1)	3.8(5.1)	10.4(8.6)	3.0(3.2)	5.0(5.9)	5.6(6.8)
Occ 5	18.4(13.1)	7.5(4.9)	12.2(5.7)	8.9(6.0)	9.1(12.9)	8.6(5.3)
Occ 6	32.6(21.3)	12.3(7.5)	21.7(13.9)	11.1(7.8)	15.5(21.9)	19.9(18.5)
Occ 7	59.5(26.3)	30.6(19.8)	40.5(21.2)	27.7(17.3)	32.4(22.6)	44.8(28.3)
Occ 8	74.7(44.0)	41.1(20.5)	47.3(20.4)	33.4(14.6)	43.0(31.1)	51.1(24.6)
Occ 9	88.2(41.9)	51.7(19.2)	56.2(28.0)	44.8(25.5)	49.1(37.8)	62.1(35.1)

TABLE 6.4.XXIII MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x COHORT FOR DV5

	Cohort 1	Cohort 2
Occ 2	2.6(5.0)	0.4(1.0)
Occ 3	4.2(7.1)	0.9(2.6)
Occ 4	10.3(12.9)	4.1(5.3)
Occ 5	13.0(10.9)	8.1(5.2)
Occ 6	22.8(19.4)	14.1(11.9)
Occ 7	43.4(25.1)	33.8(22.6)
Occ 8	53.7(33.7)	42.1(21.2)
Occ 9	63.0(38.1)	53.0(25.9)

TABLE 6.4.XXIV MEAN AND STANDARD DEVIATION SCORES FOR OCCASION x APPROACH FOR DV5

	Traditional	Eclectic	D'mental
Occ 2	1.8(4.9)	1.3(2.7)	0.9(2.3)
Occ 3	2.5(7.3)	3.2(4.5)	1.5(2.9
Occ 4	7.9(13.4)	7.5(7.9)	5.3(6.3)
Occ 5	11.0(9.8)	11.0(6.0)	8.9(9.7)
Occ 6	18.8(16.4)	17.8(13.0)	17.7(20.1)
Occ 7	40.0(25.8)	35.9(20.6)	38.6(26.0)
Occ 8	52.0(33.7)	42.3(19.5)	47.0(28.0)
Occ 9	63.6(33.0)	52.1(27.3)	55.6(36.5)

The null hypotheses relating to occasion, cohort, approach and interaction are rejected in relation to DV5. The independent variables of occasion, cohort and approach were statistically significant as main effects and in interaction with other variables. As a main effect, the null hypothesis relating to sex is not rejected on relation to DV5.

Occasion is again highly significant. The results show cohort, cohort by approach, occasion by cohort, and occasion by cohort by approach to be significant at the 1% level, and approach to be significant at the 5% level. The following graph shows the nature of the interaction between cohort and approach, with the January cohort in developmental schools outperforming the September cohort in relation to the number of different correctly spelt words used.
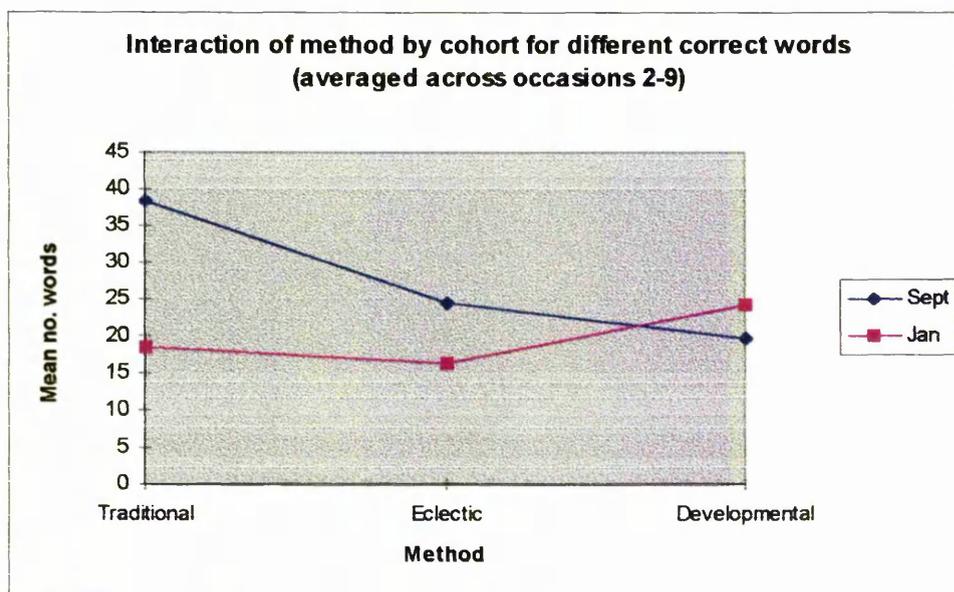
GRAPH 6.4.25   INTERACTION OF COHORT X APPROACH IN RELATION TO TOTAL NUMBER OF DIFFERENT CORRECTLY SPELT WORDS (DV5)

179

When the difference between means is considered across occasions in relation to the total number of different correctly spelt words used, the results show a different pattern from that noted in relation to the other DVs.

TABLE 6.4.XXV1 DIFFERENCE BETWEEN MEANS ON SUCCESSIVE OCCASIONS IN RELATION TO DV5 (TOTAL NUMBER OF DIFFERENT CORRECT WORDS)

	3	4	5	6	7	8	9
2	+1.0						
3		+4.6**					
4			+3.4				
5				+7.8**			
6					+20.1**		
7						+9.2**	
8							+10.2

**p<0.01

When the total number of different correctly spelt words is considered, the increase between means is highly significant between occasion 3 to 4 and 6 to 7 (which encompass a summer holiday, along with two other periods of time. These are between February and May in Year 1, and between October and February in Year 2.

One noteworthy feature of the results presented to this point is that the number of different correctly spelt words (DV5) written by children in the study increases significantly by occasion, and this increase is significant at the 1% level. This is true in relation to the whole sample (n=114), and also applies when results are considered by sex, cohort and approach. DV3, the total number of different words, also increases significantly for the whole sample by occasion, although when the results are considered by sex, cohort and approach some differences occur.

In relation to the total number of words written (DV2) and the total number of correctly spelt words (DV3), the mean scores also increased significantly by occasion for the whole sample. This increase is significant at the 5% level between occasions 2 and 3, and at the 1% level for the majority of the other occasions. The only exception to this is between

180

occasion 7 and occasion 8, when the expected increase in performance did not occur for DV2, and the mean scores actually dropped. DV3 scores did not drop in the same way but the increase in means between the two occasions was insignificant.

6.4.7 Summary

To summarise, the analyses showed that the following effects and interactions were statistically significant.

TABLE 6.4.XXVII SUMMARY OF THE STATISTICALLY SIGNIFICANT MANOVA RESULTS (N=114) AT 0.05 LEVEL

DVs	Main effects	First order interactions	Second order interactions
DV2	Occasion Cohort	Occ x cohort Occ x approach Cohort x approach	Occasion x cohort x approach
DV3	Occasion Cohort	Occ x approach Cohort x approach Occ x sex	Occasion x cohort x approach
DV4	Occasion Cohort	Occ x cohort Occ x approach Cohort x approach	Occasion x cohort x approach
DV5	Occasion Cohort Approach	Occ x cohort Occ x approach Cohort x approach	Occasion x cohort x approach

The null hypotheses relating to occasion, cohort, approach and interaction are rejected. The independent variables of occasion, cohort and approach were statistically significant on one or more of the DVs as main effects, and in interaction with one or more variables. As a main effect, the null hypothesis relating to sex is not rejected.

The inferential statistics indicate that occasion and cohort show a significant main effect at 1% level for each of the DVs 2 ,4 and 5, with Cohort 1 performing better than Cohort 2. Sex shows no main effect. Approach shows a main effect in relation to the total number of different correctly spelt words at 5% level. Although the approach adopted in schools is not statistically related to language development and the extent of children's vocabulary, it does appear to be related to the accuracy of spelling.

The interaction between cohort and approach shows significance at the 1% level in relation to each of the DVs 2-5, with the second cohort

181

(January) out-performing the cohort which started school in September in those schools adopting a developmental approach.

The results show that children make significant progress across occasions in relation to DVs 3 and 5. This development from occasion to occasion also happens in relation to Dvs 2 and 4, with a particular increase in means evident between occasions 6 and 7 and a non-significant increase following between occasions 7 and 8.

6.5 The Spelling Test (DV6)

The same spelling test was administered on three occasions, each at the end of the academic year. Occasion A was the end of the Reception year, B the end of Year 1, and Occasion C the end of Year 2. The test consisted of ten regular words plus ten irregular words.

Accuracy scores for the spelling test were derived in relation to the total number of correct responses (out of 20), the total number of correct responses for regular words (out of 10) and the total number of correct responses for irregular or exception words (out of 10). To check the reliability of scoring approximately 10% of the tests were scored by a colleague, producing inter-rater reliability of more than 95%.

TABLE 6.5.I SPELLING TEST RESULTS BY OCCASION AND BY REGULAR WORDS (N=10) AND IRREGULAR WORDS (N=10)

		OCC A REG	OCC A IRREG	OCC B REG	OCC B IRREG	OCC C REG	OCC C IRREG
TRADITIONAL APPROACH (n=46)	Mean	0.5	0.2	3.6	1.6	6.9	4.3
	Range	6	3	10	8	10	9
ECLECTIC APPROACH (n=36)	Mean	0.8	0.3	3.1	1.1	5.9	2.8
	Range	7	2	9	4	10	9
D'MENTAL APPROACH (n=32)	Mean	0.5	0.1	2.8	0.7	5.1	2.4
	Range	4	1	8	6	10	10

Occasion A = end of Reception year
Occasion B = end of Year 1
Occasion C = end of Year 2

The scores indicate a general increase in means over occasion and show that the children have greater success spelling the regular words correctly. This is evident when the scores are plotted on a graph.

GRAPH 6.5.2. MEAN TEST SCORES FOR WHOLE SAMPLE BY TYPE OF WORD

Spelling test mean scores for whole sample (n=114) by word type
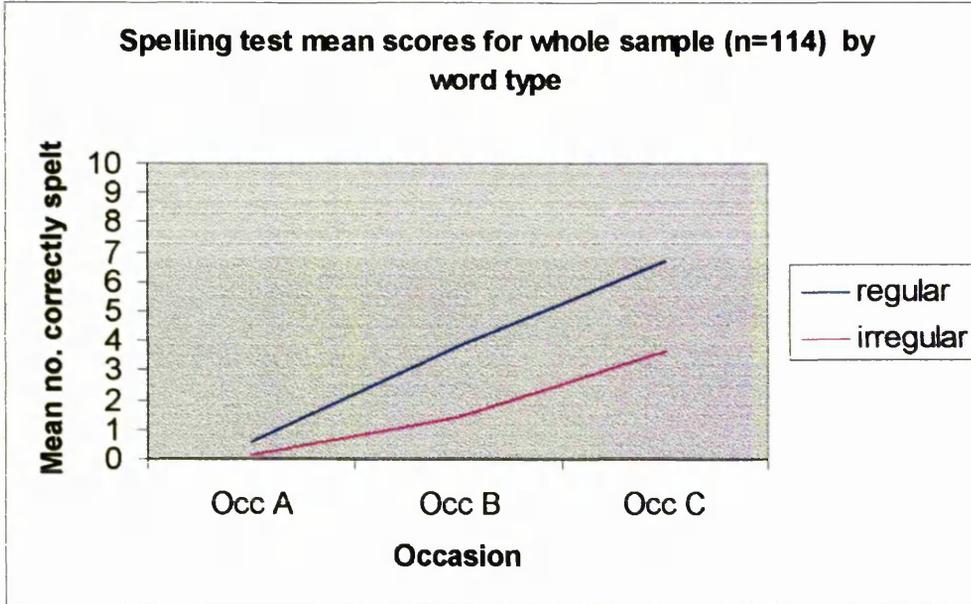
A mixed design factorial ANOVA was carried out on the scores, using the category of total number of correctly spelt words on the spelling test as the dependent variable. The scores for individual children across occasions a to c (the end of each school year) formed the within subjects measure, and the independent variables IV1-3 formed the between subjects measure. This tested for:

   a) differences between occasions (between subjects variable)
   b) differences between cohorts 1 and 2
   c) differences between those children taught by traditional, eclectic or developmental approaches
   d) differences between boys and girls
   e) the presence of interaction between these variables.

The results of the analysis are presented in the following table.

TABLE 6.5 III MIXED DESIGN FACTORIAL ANOVA TAKING THE TOTAL NUMBER OF CORRECT SPELLINGS ON THE SPELLING TEST AS THE DEPENDENT VARIABLE

	F		Significance
OCC x APPROACH x SEX x COHORT	$F_{(1,112)}$	0.72	p=0.49
OCC x COHORT x APPROACH	$F_{(2,111)}$	4.00	p=0.02*
OCCASION x COHORT x SEX	$F_{(1,112)}$	2.89	p=0.09*
COHORT x APPROACH x SEX	$F_{(2,111)}$	4.11	p=0.02*
OCCASION x COHORT	$F_{(1,112)}$	4.02	p=0.05*
OCCASION x APPROACH	$F_{(2,111)}$	8.23	p=0.00**
OCCASION x SEX	$F_{(1,112)}$	2.34	p=0.13*
COHORT x APPROACH	$F_{(2,111)}$	4.33	p=0.02*
COHORT x SEX	$F_{(1,112)}$	1.13	p=0.29
APPROACH x SEX	$F_{(2,111)}$	1.40	p=0.25
OCCASION	$F_{(1,112)}$	457.52	p=0.00**
COHORT	$F_{(1,112)}$	7.91	p=0.01**
APPROACH	$F_{(2,111)}$	421.18	p=0.00**
SEX	$F_{(1,112)}$	0.05	p=0.83

*p<0.05	**p<0.01

The null hypotheses relating to occasion, cohort, approach and interaction are rejected in relation to DV6. The independent variables of occasion, cohort and approach were statistically significant as main effects and in interaction with other variables. As a main effect, the null hypothesis relating to sex is not rejected in relation to DV6.

6.5.1 Correlation of spelling test scores

The mean scores relating to the correct spelling of regular and irregular words were correlated for each occasion for the whole sample (n=114). On Occasion A the correlation between regular and irregular words was significant at the 1% level (r=0.6632 p<0.01) which shows that children are performing comparably on each set of words. Similar levels of significance were found on Occasion B (r=0.665, p<0.01) and on Occasion C (r=0.790, p<0.01). Significant correlation is also shown when results are considered by sex, by cohort and by approach (for full details see Appendix 15).

6.5.2 Which spelling test words proved most challenging?

If the results of the spelling test are considered in detail, and the words are separated according to regular/irregular, the following rankings occur. The rankings are remarkably similar from Occasion A (Reception) to Occasion C (Year 2).

TABLE 6.5.IV TABLE RANKING THE REGULAR WORDS IN THE SPELLING TEST BY ORDER OF DIFFICULTY, WITH % OF CHILDREN SPELLING WORDS CORRECTLY ON EACH OCCASION

REGULAR SPELLINGS	% CORRECT OCC A	% CORRECT OCC B	% CORRECT OCC C
sat	56	80	92
went	27	77	88
sand	27	60	83
fish	13	50	79
window	9	35	66
garden	6	14	45
going	4	40	76
played	2	25	47
holiday	2	15	32
flowers	0	7	36

**TABLE 6.5.V TABLE RANKING THE IRREGULAR WORDS IN THE
SPELLING TEST BY ORDER OF DIFFICULTY, WITH % OF
CHILDREN SPELLING WORDS CORRECTLY ON EACH OCCASION**

IRREGULAR SPELLINGS	% CORRECT OCC A	% CORRECT OCC B	% CORRECT OCC C
was	22	68	89
said	7	27	56
what	2	16	47
island	2	8	30
castle	0	7	31
people	0	6	27
friend	0	6	25
does	0	6	15
build	0	3	15
journey	0	0	7

This table shows that the ranking of words was generally consistent across the three occasions of testing.

6.6 The words written by the children in unaided writing

This section will consider several aspects of the children's writing which were made possible by the CHILDES analysis. The use of the Freq program in CHILDES enabled a full analysis of children's word use, and thus comparisons can be made with previous findings. This section will report a selection of those results which are of pedagogical interest.

6.6.1 Word frequency of all words produced in unaided writing

Previous studies (e.g. McNally and Murray, 1962) have indicated that a certain corpus of words is central to most English writing. With the Freq program applied to all schools, all occasions and all words (i.e. correctly and incorrectly spelt), the top twenty words were exactly the same as when the program considered only correct spelling. One difference was in the ranking of the word **to**, which was used inaccurately to represent both **too** and **two**, with a substitution for **too** being by far the most frequent error. The ranking of **they** and **on** also shows a slight change.

TABLE 6.6.1 RANK ORDER OF MOST FREQUENTLY USED WORDS IN UNA...

TOTAL WORDS		TOTAL CORRECT	
the	7069	the	6995
and	6752	and	6746
a	2817	a	2752
to	2680	he	2321
he	2357	to	1912
it	1849	it	1835
was	1834	was	1829
she	1761	she	1760
in	1660	in	1653
went	1235	went	1224
they	1186	on	1175
on	1183	they	1134
his	1131	his	1126
then	1070	then	1066
so	1050	so	1039
of	1039	of	854
pig	836	pig	805
up	800	up	797
got	768	got	760
house	736	house	735

6.6.2 How does this result compare with previous findings?

If the McNally and Murray (1962) words are considered, there are some similarities.

TABLE 6.6.II TABLE COMPARING THE MCNALLY AND MURRAY (1962) TOP TWELVE WORDS WITH THE CURRENT STUDY

MC NALLY AND MURRAY (1962) TOP TWELVE	RANKING OF SAME WORD IN CURRENT STUDY	RANKING OF THOSE WORDS NOT PRESENT IN TOP TWELVE OF CURRENT STUDY
a	a [3]	
and	and [2]	
he	he [4]	
i		I [36]
in	in [9]	
it	it [6]	
is		Is [43]
of		of [16]
that		that [51]
the	the [1]	
to	to [5]	
was	was [7]	

The top seven words in this study were also identified in the top twelve of McNally and Murray (1962). One of the more significant differences was that the female pronoun **she**, which did not feature significantly in 1962, was in the top ten of this study, (**she** [8]). The word I did not feature in the present study as personal writing was not required.

6.6.3 Correctly spelt words

Which correctly spelt words (excluding numerals) were used most frequently used by the children on each occasion? Table 6.6.III gives the top ten correctly spelt and most frequently used words on each occasion (2-9) in frequency order.

TABLE 6.6.III THE TOP TEN CORRECTLY SPELT WORD ON EACH OCCASION FROM 2-9 IN FREQUENCY ORDER AND INDICATING THE NUMBER OF USES.

OCC 2		OCC 3		OCC 4		OCC 5		OCC 6		OCC 7		OCC 8		OCC 9	
a	63	a	69	the	265	the	616	the	490	and	1426	and	2048	the	2596
the	53	and	61	and	262	a	522	and	72	she	1401	the	1939	and	1923
and	52	the	45	to	189	and	506	a	210	the	996	he	1101	he	1070
they	19	mum	42	red	137	it	222	to	209	it	860	his	732	pig	791
on	10	to	40	a	136	up	191	was	180	was	860	a	577	a	707
had	9	his	37	she	74	was	186	they	158	went	494	Sam	577	to	681
mummy	9	in	26	in	55	cat	159	in	147	a	463	on	561	house	673
nest	9	it	26	he	46	then	115	her	135	in	455	got	508	of	517
in	7	get	23	was	41	they	87	she	132	then	424	in	477	in	497
made	7	bed	20	you	41	trunk	74	up	103	bed	408	to	453	pigs	469

(For the purposes of this study, plurals and different verb forms are considered as separate words, see Nunes, Bryant and Bindman, 1997).

6.6.4   Incorrectly spelt words in the top one hundred

Of the most frequently used one hundred words (taking the sum of words used across all occasions), only seven were incorrectly spelt. In each case, the correctly spelt version of the word also appeared in the top one hundred, and in each case there were more examples of the word being correctly spelt than incorrectly, and the correctly spelt word was ranked more highly.

The following table (6.6.IV) shows the spelling, the number of occurrences of the word, and in square brackets, the ranking of the word, for both the incorrect and the correct version of these seven words.

TABLE 6.6.IV THE SEVEN INCORRECTLY SPELT WORDS IN THE HUNDRED MOST FREQUENTLY USED WORDS

INCORRECTLY SPELT WORDS			CORRECTLY SPELT VERSION		
WORD	NO. OF OCCURRENCES	RANKING	WORD	NO. OF OCCURRENCES	RANKING
wos	301	[47]	was	1846	[7]
sed	189	[72]	said	739	[20]
bers	177	[77]	bears	297	[48]
ther	165	[81]	there	514	[32]
sum	140	[91]	some	392	[38]
hed	134	[93]	head	219	[61]
ber	118	[100]	bear	294	[49]

6.6.5   Do gender differences exist in relation to correct spellings?

In order to examine this question in some detail, occasion 9 writing samples were further examined. All correct spellings were counted and ranked for both females and males. The results showed that of the fifty most frequently used words, 46 were common to both boys and girls (see Appendix 12).

6.6.6   Do gender differences exist in relation to spelling errors?

The top five errors for both girls and boys involved the same set of words.

TABLE 6.6.V TOP FIVE SPELLING ERRORS BY MALES AND FEMALES

TOP FIVE ERRORS IN ALL FEMALE WRITING SAMPLES		TOP FIVE ERRORS IN ALL MALE WRITING SAMPLES	
Word +	number of correct spelling occurrences	word +	number of correct spelling occurrences
to=too	446	to=too	281
wos=was	143	wos=was	142
there=their	117	of=off	90
sed=said	104	there=their	83
of=off	84	sed=said	76

6.7 Classification of spelling errors

In Chapter 3, the stages described by the Virginia school suggested that definable patterns exist in children's invented spellings. If these researchers, for example Gentry (1977), are correct, the expectation would be that such misspellings would follow certain patterns, as identified in their research.

The most frequently occurring incorrectly spelt word in this study was the word **was**. The following examination of the spelling errors relating to this word will consider whether the evidence supports the stage theories. CHILDES' Freq and Kwal programs were used to isolate the examples of **was** in the children's free writing.

Gentry (1977,p.23) suggested that the following sequence would apply to the spelling of the word **type.**

strategy	example	comment
deviant	**menena**	
prephonetic	**tp**	segments omitted
phonetic	**tip**	letter name or tense/lax pairing
transitional	**tipe**	standard correspondence or marker
correct	**type**	completely standard spelling

If Gentry's model was adapted to the word **was**, the predicted spellings might be as follows.

strategy	example	comment
deviant	**faoanp**	random representation
prephonetic	**ws/wz**	vowel or segment omitted
phonetic	**wos**	letter name or tense/lax pairing
transitional	**waz**	standard correspondence or marker
correct	**was**	completely standard spelling

According to Gentry and his colleagues in the Virginia School, all children would be expected to go through the stages indicated. However, when this model was applied to the word **was** written in free writing by the children on

191

each occasion, such categories and stages of development were not reflected in the actual range of invented spellings (see Appendix 14 for full details). Some of the observed findings were as follows.

- Some children (20%) did not produce invented or non-conventional spellings, so did not go through the stages suggested by the Virginia school, but wrote the word **was** correctly from the start. This included a small number of children who wrote conventionally from Occasion 2, plus a much larger group who spelt **was** correctly from the first time their writing consisted of conventional letters (used either randomly or purposefully).

- Many children (19%) spelt the word **was** correctly on one or more occasions, but on subsequent occasions produced non-standard spelling(s) of the word.

- The number of deviant spellings was very limited.

- The evidence suggests that all children attempt to make use of available phonological knowledge, but not in the way defined in the pre-phonetic stage identified by Gentry. For example, children seemed more likely to include vowels in their attempts than the Virginia School had indicated, and the final consonant was only important to half the children on occasion 2. Gentry's predicted pattern of both consonants being represented with the vowel omitted was not found until the final occasion, and was only used twice in the whole study in the context of free writing.

- A number of children produced spellings which were classified as possible visual errors, and some of these were correct spellings of other words which were then read as **was.** The Virginia model does not allow for this type of spelling.

. These findings will be discussed in Chapter 7.

6.8 Revisiting the hypotheses

Ho(1)   **Null hypothesis: stated approach to spelling instruction (traditional v eclectic v developmental)**

There is no real difference between the mean scores of the children receiving different approaches to

spelling instruction on each of the six dependent variables.

This study failed to reject the null hypothesis Ho(1) in relation to DV1, DV2 and DV3. However, a main effect can be seen between stated approach to writing instruction and the total number of correct spellings produced (DV4), and between stated approaches to writing instruction and the total number of different correctly spelt words (DV5).

Ho(2)   **Null hypothesis: sex (boys v girls)**

There is no real difference between the mean scores of boys and girls on each of the six dependent variables.

This study failed to reject the null hypothesis Ho(2). No real difference was found between the mean scores of girls and boys.

Ho(3)   **Null hypothesis: date of admission to school**

There is no real difference between the mean scores of different cohorts on each of the six dependent variables.

The null hypothesis is rejected. There is a significant difference between the mean scores of different cohorts in relation to DV1, DV2, DV3, DV4 and DV5.

Ho(4)   **Null hypothesis: occasion (1 to 9)**

There is no real difference between the mean scores of different occasions on each of the six dependent hypotheses.

The null hypothesis is rejected. There is a significant difference between the mean scores on each occasion.

Ho(5)   **Interactional null hypothesis**

There will be no real interaction between any combination of the four independent variables and any of the six dependent variables listed above.

193

The null hypothesis is rejected. Interaction between cohort and approach was proved for each of the dependent variables DV2-5.

CHAPTER 7: DISCUSSION OF THE RESULTS

7.1 Difficulties in researching children's writing

In discussing the results of this study and drawing conclusions from the findings, the difficulties in researching young children's writing must be borne in mind. Dyson (1985) lists some of the challenges faced by researchers trying to chronicle the "stages" of young children's writing. Firstly, written language, like oral language, is a complex of interconnecting systems, namely syntactic, semantic and discourse rule systems. Children do not display their knowledge of these systems in neat sequential order but in clumps which the researcher must separate into neatly organised categories. Context forms another challenge, as written language is not an independent activity but is subject to the demands of the situation "like a kaleidoscope, its parts are ever newly arranged, newly revealing" (1985,p.59). A third difficulty relates to the nature of the writing system. Unlike oral language, written language has both a graphic and a linguistic dimension and the dual nature of the writing system initially eludes young children.

> "Children may, therefore, operate outside the very definition of written language assumed by adult researchers; they may not attempt to convey a particular message through an alphabetic (graphic/linguistic) system"
> (Dyson, 1985,p.59).

In this study the written work produced has been taken as evidence of each individual's stage of writing development on a given occasion. Due to the challenges mentioned above, it may be that conclusions have been drawn from the written evidence which do not take full account of the varying demands on the child. The context was controlled to the extent that a similar experience was presented to each child, and the message quality or semantic representation was considered separately from the graphic production. Making judgements of children's ability based on one sample of

195

writing each term has its weaknesses, and other aspects of performance might have affected the results. This might apply to any of those aspects of development which were discussed in some detail in the first section of Chapter 3, For example, some children made marks on the page, but had not learned which marks represented conventional graphemes. Some had not made the connection between speech and writing, and did not know that their ideas could be recorded. Some wanted to write, and were able to separate the phonemes they wished to represent but had not learned the conventional way of representing the relevant grapheme. One child, for example, asked the researcher "What's a `b' - how do you write a `b'?" Immaturity in motor control could account for some of the `errors' which might have led to false positive or false negative spellings due to inaccuracies in graphemic representation. Physical slips of the pen might also have produced errors, and so the actual results may not accurately represent the true ability of the subjects. Moreover, the study cannot do justice to an examination of how language develops in a non-linear manner. It cannot for example, take account of those children who chose not to write, or not to produce a great deal of writing, because they knew they could not write conventionally and chose not to fail.

In asking children to write stories, the study was able to consider their spelling within a context. This naturalistic approach has the benefit of seeing writing as meaning-making rather than a decontextualised activity, but the task demanded that attention be given to the story as well as to the spelling. This will have created more demands on the young writers than the experimental approach of the spelling test.

> "Attention to one thing means neglect of another, and
> so one can never be sure that the child's failure to do
> something in writing indicates a lack of competence. It
> may merely reflect an inability to direct cognitive
> resources to that aspect of writing when it is needed"
> (Scardamalia & Bereiter, 1983, p.68).

The discussion of the results is predicated upon such acknowledgements.

196

7.2 Discussion of results

This study set out to examine the development of conventional spelling in young writers during the first three years of formal schooling. Its theoretical basis is that of constructivism, with the expectation that young children adopt an active approach to all learning, including learning to spell. The desire to communicate will lead children to learn, through experimentation and hypothesis testing, the conventions of print. With experience and education children are able to develop the ability to spell conventionally. The way in which we learn to spell is not yet fully understood, and the study set out to explore whether children's writing would offer support for the various theories which have been put forward.

7.2.1 Outline of the chapter

The study was designed to contain both a naturalistic element which tested the first five of the dependent variables, and an experimental element to test the sixth. In the naturalistic part of the study, the children provided samples of free writing on a termly basis which were studied for evidence of

the message concept (DV1)
the total number of words produced (DV2)
the total number of different words produced (DV3)
the total number of correctly spelt words produced (DV4)
the total number of different correctly spelt words produced (DV5)

The experimental element of the study, the spelling test, formed DV6, and enabled some study of whether children start to spell via a phonological or assembled route.

The independent variables were those of schools' stated approach, sex, cohort and occasion.

The independent variables will be considered first. Approach will be discussed in section 7.3, sex in section 7.4, and cohort in 7.5. Section 7.6 will consider occasion. Following this, the dependent variables will be considered. The message concept (DV1) will be discussed in section 7.7. Following this, section 7.8 will take a qualitative look at the words written in free

197

writing by the children, and finally the spelling test results will be discussed in section 7.9. Following this will be some general discussion relating to spelling theories.

7.3 Approach

In Chapter 3 (3.7.2) it was argued that a teacher's philosophy, whether implicit or explicit, would affect the teaching approach adopted within classrooms. It was hypothesised that approach might influence the way in which children learned, and the study was focused in schools which clearly stated their approach to the teaching of writing. This enabled a comparison of those schools which used copying as a major means of teaching children to write (traditional) with those adopting more recently advocated approaches which encourage experimentation and exploration (developmental). The eclectic category used a mixture of approaches.

In relation to the message concept, no significant difference was found between the various approaches. This lack of difference was unexpected, given the different approaches to writing adopted in the schools. Those schools adopting a developmental approach placed great emphasis on the use of writing as a means of communication, whereas the schools adopting a traditional approach used copying and overwriting and considered correctness to be more important than meaning-making in early writing. These differences did not impact significantly on children's willingness to ascribe a message to their texts.

When considering the dependent variables 2 and 3, no significant differences were found between the different approaches to teaching in relation to the total number of words written or the total number of different words written. Again, it might have been expected that the emphasis within the developmental schools on the use of writing as a means of communication might have led to the children in these schools writing more freely than in the schools adopting a traditional approach. Clarke's work (1988), for example, would seem to suggest that the children in schools adopting a developmental approach might write more freely and produce more words, but this was not

198

found to be the case.

Approach did, however, appear to have some impact on the children's ability to spell correctly, in relation to the number of different correctly spelt words written (DV 5), and this difference was significant at the 5% level. Closer examination of the data shows that the traditional approach leads to the highest mean scores in relation to this DV, the developmental approach has the second highest mean scores, and the eclectic approach results in the lowest means (see Tables 6.4.XXI and 6.4.XXIV). However, no significant difference was found in relation to DV4, the total number of correctly spelt words.

Approach was highly significant in relation to the spelling test results. The children in schools professing a traditional approach achieved the greatest success on the spelling test with both regular and irregular spellings. The developmental approach schools scored the lowest means on the tests, with the eclectic schools between the two. It should be noted that the children in the traditional schools were more used to undertaking spelling tests, and this may have had some influence on the results.

Overall, the results indicate that the method of instruction adopted within schools has some effect on children's spelling development, particularly in relation to the development of correct spellings (DV5) and to performance in spelling tests (DV6). However, although the traditional approach achieved the best results in relation to DV 5 and 6, there was no overall consistency as to which of the other approaches was most successful. Also, no significant relationship was found to exist between approach to teaching and children's overall writing development as measured by DV2, 3 and 4. What might this mean?

◆ It could mean that the differences between teaching approaches did not actually exist. Although the schools or departments professed to have an agreed approach to teaching, individual teachers might not actually apply the stated methods in their classrooms.

> "Results of research assessing different teaching methods
> raise an important question: Did the actual teaching conform

199

to the formulaic labels attached to the methods being
compared?"
(Rosenblatt, 1994, p.1087)

♦ It could mean that teaching method has no effect on children's learning -
that children learn in spite of what is done to them and make use of such
instruction in a way which suits them.

> "A method may help or hinder, facilitate or complicate,
> but not create learning. Obtaining knowledge is the
> result of the learner's own activity"
> (Ferreiro and Teberosky, 1982, p.15).

The children across all six schools (representing three approaches
to teaching) made progress in similar ways and at similar rates in relation to all
of the dependent variables. Perhaps this suggests indicate that that there is a
natural `pattern' in learning to write and spell which is similar to that of learning
to speak and which applies to all children? Temple, Nathan, Burris and Temple
(1982) saw children as going through similar stages of development

> "Even when they are not taught about writing, most
> children make essentially the same discoveries about
> it, in essentially the same order"
> (Temple, Nathan, Burris and Temple,1982, p.2).

Although society and the media generally put forward the view that
teaching methods do affect learning, some writers have offered an alternative
opinion. Downing's quote relates to reading, but could equally well be directed
at writing.

> "In other words, reading is a skill, and therefore, no
> matter what framework of teaching methods and
> materials we set reading in, its essential
> psychological features assert themselves. The brain
> processes that determine the course of skill
> development operate constantly in learners despite
> the variety of methods and materials used in reading
> instruction" (Downing, 1984, p.34).

7.4 Sex

Boys are generally considered to perform less successfully at primary age in relation to reading and writing than girls. In the present study the performance of the two groups showed no significant statistical difference, and it is the similarities between boys and girls, rather than the differences, which are noteworthy. Firstly, boys and girls used a similar range of words in their writing. To some extent this might be expected, as the writing tasks involved the retelling of a story told or read to the children, but these similarities occurred both within schools and across different schools and in schools adopting different approaches to teaching writing. The range of literary experiences and the vocabulary developed through different home, social and play experiences for children across a range of schools and backgrounds might be expected to lead to differences between boys and girls.

When the Freq program was run on all CHILDES coded writing samples taking account of gender, the top seventeen words used by boys and girls were the same. Within these seventeen words some differences in ranking occurred, but overall the similarities are remarkable (Appendix 12).

Taking the final occasion as an example, an analysis of the fifty most frequently used words shows that forty six of these were common to the writing of both boys and girls. If gender is considered in relation to each type of approach, a similar pattern emerges. More than 75% of the words used are the same for males and females. Boys and girls also made spelling mistakes in a similar range of words. Again, the similarities between the sexes are remarkable. In order to illustrate these similarities, lists of words written by boys and girls are provided in Appendix 12. Chart 6.6.V showed that boys and girls make the same errors in the five words each gender wrote incorrectly. All of these errors are good phonetic alternatives, which might suggest the use of phonology by the writers. Two of the substitutions are homophones (**to** and **there**) and analogy could have played a role in relation to **sed, (bed, red** and so on).

No significant differences were found between the scores of girls

and boys in relation to any of the dependent variables. This does not match the findings of previous studies.

7.5 Cohort

The legal requirement that children have to start school in the term after their fifth birthday led to LEAs determining admissions policies which facilitated this. At the time of the study some used termly admissions for 'rising fives', whilst others, like the LEA in the present study, had two admissions points in the school year. (More recently, changes in government funding have altered this practice and have led to most LEAs adopting one entry point in September). As the children in the second cohort are the younger children in the year group, and as they have one term less than their peers of formal education, it was hypothesised that significant differences might exist between the two sets of children. This was found to be the case. Whether this difference relates to age or to the amount of formal education received could not be determined in this study, but the fact that there is a significant difference does need to be taken into account by educationalists and by parents in interpreting test results. Testing at seven is now part of educational practice, and these results are currently used to make comparisons of children without taking account of cohort. The results are also used to compare the effectiveness of schools, yet no account is made of how the number of children in the younger cohort might skew the results and the school's overall profile.

In those schools adopting a developmental approach, the second cohort out-performed the older children in relation to DVs 2-5. The study could be usefully replicated to see whether similar results would occur.

With regard to the spelling test, cohort was found to be highly significant as a main effect, and significant in interaction with other variables except sex. The children in the first cohort obtained the higher scores.

7.6 Occasion

It was expected that the total number and the range of words written would increase by occasion over the three years of the study,

demonstrating development in children's oral language, reading progress and the growth of written vocabulary. This progress would be due to maturation and developing language ability, and to the amount of formal education received. Analysis of the results showed that this was generally the case in relation to each of the dependent variables, and approach was found to be highly significant as a main effect in relation to each of DVs 2-6. Significant progress was made by children between occasion 2 and occasion 9.

At a simple level, it was assumed that the children's linguistic development and maturation, plus the increased time spent in full time education, would lead to a gradual increase in the total number of words produced and in the total number of different words used on each successive occasion. This might be attributed to children's ability to use remembered words and their ability to invent spelling according to their increasing understanding of sound/symbol relationships. It is recognised that this is an assumption, and that the analysis in the present study takes no account of the quality and complexity of the stories written. It is accepted that some children may have produced shorter stories which were cleverly crafted, but this study expected that the average number of words produced would increase over time, both due to the children's growing vocabulary and their increasing skill in writing. Although individual children would vary and would progress at different rates, it was presumed that children's writing would show increases in the number of words used. As an overall trend this was certainly found. This was a general trend for all approaches to the teaching of writing, for both males and females, and for Cohort 1 and Cohort 2.

Clarke's work (1988) would seem to suggest that the children in schools adopting a developmental approach might write more freely and produce more words, whereas those taught more traditionally might make fewer spelling errors than those taught by developmental methods. Although the results offer some support for the latter statement, the children in developmental schools did not produce significantly more writing than those taught by other approaches.

203

A gradual increase in the averages for DVs 2-5 can be seen in the data presented in Chapter 6. What is perhaps more surprising is the particular increase in the total number of correctly spelt words and the total number of different correctly spelt words at certain times. Closer examination shows that two periods display particular increases. These are between occasions 3 and 4, and between occasions 6 and 7, with the latter period showing a particular increase. This is followed by a period during which the scores show insignificant improvement, and there is some regression in relation to total words between occasions 7 and 8.

As all visits to schools took place close to the half-term holiday, either in the week before or the week after the half term break, those periods of time during which children's writing shows considerable improvement reflect the period from mid May/early June to late October/early November. These periods include a six week summer holiday and a likely change of teacher, yet still this improvement occurs. There are several possible explanations for this seeming spurt in development, which will be explored in turn.

Is this maturational?

This would seem to be a logical explanation, but the children in the study were born throughout the period September to February. If maturation were the key, it would be expected that this spurt in performances would be spread across the school year, reflecting children's ages and stage of maturation. The second cohort might reasonably be expected to show the same spurt at a later point. The fact that both cohorts demonstrate this spurt at the same time would suggest a reason other than maturation alone.

Is to do with length of schooling?

The research includes two cohorts of children. The first cohort, who started school in September, are the older children in the study, as they will have had their fifth birthdays between September and February of their Reception year. Children with birthdays between February and August started school in January, and were in the second cohort. If length of schooling was the explanation for the spurt in progress, it would be expected that Cohort 2,

204

who started school one term later than Cohort 1, might demonstrate this progress one term after their classmates. As this does not happen, it would appear that length of schooling is not the key.

Does it relate *to teaching emphasis?*

This is a possibility. Personal experience and discussion with colleagues over many years shows that the autumn term is generally regarded as the one most conducive to sustained academic work and teachers feel that academic progress should be evident here. The first half of the autumn term directly preceded the visits to schools, and the concentration of academic work and high teacher expectations at this time might account for the children's progress. If this trend represents actual improvement related to the timing of the visit, it might indicate that children are capable of making good progress at this particular time of year. If so, could teachers make better use of this? Further examination of this would be a useful guide to teachers and parents and could form the basis for future studies.

Does it relate to the task?

It appears possible that the nature of the task affects performance. It was envisaged in setting up the study that the narrative tasks would place similar demands on the children. The actual writing performance might suggest that certain tasks were easier than others. In Chapter 5 it was noted that on several occasions the focus was on a traditional fairy tale, and that this familiarity made the compositional aspect of writing less demanding than if the story was previously unknown. The results could be interpreted in this way, and in retrospect this mixing of genres might be considered a weakness of the study. Traditional tales were used on occasions 4, 7 and 9, namely Little Red Riding Hood, Goldilocks, and The Three Pigs. The results may suggest that children find the re-writing of known tales to be easier than other re-writing tasks, as the composition of the story becomes less demanding and more attention can be directed to the secretarial aspects of writing. The use of known tales could also explain the slight regression in the means for total word

205

production on occasion 8, when a more challenging task was set, although this challenge was not predicted when the study was being designed.

However, if this spurt in progress is related to the nature of the task alone, one might expect a similar spurt to be obvious between occasions 8 and 9, when the re-telling of an unfamiliar story was followed by the retelling of a known tale. This does not happen.

No one of these explanations seems to fully explain the noted improvement in performance, particularly that between occasions 6 and 7. Further study to establish whether this improvement occurs in all children would be of great benefit to educationalists

7.7 The message concept (DV1)

The results presented in Chapter 6 show that it is during the Reception year in school that the development of the message concept occurs. By the time children have spent two or three terms in school they have come to accept, either due to their own development or in response to adults' expectations, that the marks they make on paper, no matter how conventional or unconventional these might be, can be ascribed a message. A closer study of the detail behind such facts shows that the message concept appears to develop independently of other aspects of writing development. Some children in the study were willing to offer a message for a drawing, a pre-graphemic text, a graphemic but non-regular text, as well as for truly communicative text. It was possible to take account of this in the study as the researcher was with each child as the work was done, and was able to record whether or not a message was offered, what the message was, and how the given message related to the graphemic symbols on the page.

The evidence shows that it is not until children have one full year's schooling that the message principle is firmly established for all children.

During the course of this research it has become evident, both from observation of the children and from reviewing the literature, that little attention has been paid to the message-making aspect of children's early

writing (De Goes and Martlew, 1983; Dyson, 1985, 1994). The evidence of the present study would suggest that there appears to be a range of possible behaviours which children exhibit before they become communicative writers. These are explored in this chapter. They are not offered in any form of hierarchy, and a far closer examination would be needed to see whether the behaviours happen in any given order across time, but children do offer us considerable information about their understanding of what writing is, and what writing can do.

A closer analysis of the children's message-making was carried out on the writing samples obtained on Occasion 2. This analysis revealed some patterning in the responses made by children who had not grasped the message concept, and it was possible to group these into broad categories. All responses are provided in Appendix 11, and the results were summarised in Chapter 6. The following section offers some possible explanation for children's behaviour in the various categories which were identified. (The order in which these are presented is not significant).

No message: The child who does not offer a message may do this for a number of reasons. Firstly, the child may know that writing is symbolic, and may also know that s/he cannot write. Silence or a shaking of the head when asked about their work may indicate an understanding far deeper than the surface response would indicate. Some of the 'don't know' responses reflect similar understandings.

`Can't write' or `don't know': Children who made these responses know two things. Firstly they appear to know that writing forms a lasting record and can be read. Secondly they know that they have not yet learned to read, or to `crack the code'. Such responses reflect an honesty and an awareness of print's purpose. It is possible that children making such statements understand the message concept, and know their own limitations in deciphering the message, but this is supposition and would warrant more detailed study.

One child in this category drew a picture, but said he could not

write. "I can't - I don't know how to." This child has grasped the difference between drawing and writing, but was not prepared, as were some others, to experiment with letter forms. He appears to understand that convention is important, and knows his own limitations. This conclusion would not have been possible from judging his drawing in isolation from his verbal response. The drawing, and its lack of accompanying print, reflect a deeper understanding of writing than is at first apparent.

Another child who drew a picture and accompanied it with pre-graphemic symbols said " I don't know how to write - I'm left handed you know." Although more willing to experiment, this child is not necessarily at a more `advanced' stage than the child who would not write. He has some awareness of broader conventions, such as knowing that left-handedness might be worth remarking on, but may not know the difference between drawing and writing. The question of whether the pre-graphemic symbols were drawn for his own satisfaction, or because this seemed to be the behaviour adults expect in classrooms, remains unanswered.

`Just letters' or `just writing': Children making this response appear to know that their own writing has no communicative purpose - that the marks are just randomly made on the page. They did not make these marks to record any message. It may be, however, that these children also know that they cannot read.

This comment was only made by children who produced conventional graphemes, and not by any child who drew or produced non-standard letters. These children have, therefore, developed the concept of print and an awareness of terminology

The only children to make this response were in schools adopting a traditional approach. In such schools, the beginning stages of writing were taught by copying and over-writing, and the link between message and text might not have become apparent to the children. Further study of this would be interesting, to explore whether this type of response is linked to teaching approach.

<u>Can't remember.</u> These children seem to know that writing can communicate a message, but do not appear to have realised that there is a permanence to the writing itself. These writers are implying that they wrote with a purpose, but that they have since forgotten what it was all about.

No children in schools adopting a developmental approach made this response. Again, this might be due to the children's experience in school. Adults in the developmental schools stressed that writing was intended to communicate, and the children may have learned to provide a message in order to please the adult.

<u>Labelling (e.g. `it's about the bird')</u>: Such children have an awareness that writing can relate to a topic, and by giving this response they indicate that their `writing' complies broadly with the task set by adults.

<u>Providing a narrative (one sentence or more)</u>: Such children know that writing can have meaning, and know that writing can be read. They do not necessarily know about one-to-one correspondence, as the message provided by some children did not match the number of written units presented. They do not necessarily understand the permanence of the message, as some children altered their message during conversations with the researcher. The children in this category have not mastered the direct relationship between phoneme and grapheme, or spoken and written words, as the narrative given did not match the text which was produced.

Children adopted different approaches within this broad category. One child was providing a message which matched the lines of print on the page (although showed no one-to-one correspondence). The child got to the part of the message " ... so they moved out of the way till it cracked but .." then said "I haven't got any more writing" and stopped the message mid-sentence. This child knows about the broad relationship between print and speech, though not at the word level, whereas one girl who found herself in a similar position added another line of symbols to complete her message.

Are any of these behaviours more `advanced' than others? At first

sight it might appear that the child who remained silent and offered no message is less advanced as a writer than the child who offered a label, but can such a simple distinction be drawn? The silent child may be well aware of what writing can do, but may also be aware of his/her own limitations. In fact, silence may be the most advanced of these behaviours (e.g. De Goes & Martlew, 1983; Luria, 1983; Sulzby, 1985. See 3.4).

This element of the study also provided a great deal of information about children's writing behaviours. Four of the children who were willing to offer a message did not make any reference to their papers while doing so, as was observed in Luria's study (1983), and others expected the researcher to be able to read their marks (Smith and Elley, 1998).

Many of the children had not grasped the directionality of print for either reading or writing. Some placed marks randomly on the page, or started in the centre or at the bottom. Line organisation did not always go from left to right, and from top to bottom. This did not match previous research findings. (section 3.3.3).

On occasion 2 some of the children were in their first term of schooling, while others were in their second. Although such a range of observed behaviours is not unexpected in young children of this age and experience (Clay, 1975), the national expectations of children in Reception class demand far higher levels of understanding and performance.

The influence of phonics teaching was apparent, with some children trying to sound out the letters they had placed, seemingly randomly, on the page. These children had learned that there is a relationship between graphemes and phonemes, and this knowledge was put to use when they were describing their writing. The connection between their work and the story which had been used as a stimulus had been lost, or superseded by this letter-sound knowledge.

The development of the message concept does not appear to happen conclusively, but rather evolves and develops over time. The study noted the achievement of the message concept on that occasion where a

message was given, and where no subsequent occasion saw a lack of message offered. Many children appeared to understand that writing carries a message, but did not maintain this behaviour on subsequent occasions. The examples of messages provided by the children (Appendix 13) shows that the children who are silent and give no message have sometimes previously allocated meaning to their work, (children 1, 2 and 3), supporting the theory that non-response can be an advanced behaviour (Luria, 1983; De Goes & Martlew, 1983; Sulzby, 1985). Such silence can last for two or three occasions, making a total of six months.

Further study of this aspect of children's writing would certainly add to our knowledge base.

7.8 The words written in free writing (DVs 2-5)

This section will consider some of the qualitative results of the study, in relation to both conventionally spelt words and incorrectly spelt words. Previous studies (e.g. McNally and Murray, 1962) have indicated that a certain corpus of words is central to most English writing. The use of the Freq program in CHILDES enabled a full analysis of children's word use, and thus comparisons can be made with previous findings.

7.8.1 Word frequency considering all words produced

With the Freq program applied to all schools, all occasions and all words (i.e. correctly and incorrectly spelt), the top twenty words were exactly the same as when the program considered only correct spelling. One difference was in the ranking of the word **to**. Further examination showed that this had been inaccurately used to represent both **too** and **two**, with a substitution for **too** being by far the most frequent error (see 6.6.V).

One factor affecting in word frequency is the nature of the writing tasks involved. The retelling of fiction, particularly of fairy stories, had two effects. The first was that certain vocabulary occurred which might not be expected in a general survey of writing. For example, certain words related specifically to the stories used, and will have influenced their selection. (e.g.

211

pig [18] and **pigs** [23], **wolf** [39], **bears** [45] and **Sam** [25]). **Little** [29] also featured more prominently than may be usual because of **Little Red Riding Hood**. The second consequence of this approach could be the under-representation of the personal pronoun I, which has been represented in previous studies (eg McNally and Murray, 1962).

7.8.2 Incorrectly spelt words in the top one hundred:

Of the most frequently used one hundred words, only seven were incorrectly spelt. In each case, the correctly spelt version of the word also appeared in the top one hundred, and in each case there were more examples of the word being correctly spelt than incorrectly, and the correctly spelt word was ranked more highly.

The following table shows the spelling, the number of occurrences of the word (n), and in square brackets, the ranking of the word, for both the incorrect and the correct version of these seven words.

TABLE 7.8.I THE TOP SEVEN INCORRECTLY SPELT WORDS IN THE TOP ONE HUNDRED

Incorrectly spelt words			Correctly spelt version		
word	n	rank	word	n	rank
wos	301	[47]	was	1846	[7]
sed	189	[72]	said	739	[20]
bers	177	[77]	bears	297	[48]
ther	165	[81]	there	514	[32]
sum	140	[91]	some	392	[38]
hed	134	[93]	head	219	[61]
ber	118	[100]	bear	294	[49]

Although **ber** and **bers** are the same word with addition of the plural morpheme -s, they are considered separately in this analysis (see 6.6.3)

The spelling of the word **was** will be considered in greater detail in

section 7.9.3.

7.8.3 The nature of the spelling errors in free writing

If the incorrect spellings are considered) it can be seen that these are all phonetically plausible alternatives, and that the errors all relate to vowels rather than consonants. This is unsurprising, given the argument presented in section 3.3.8.

> "In contrast to the consonants, the alphabetic conduct
> of the vowels is just plain disorderly. In print, each
> vowel can represent any of many different sounds or
> none at all"
> (Adams, 1990, p.118).

The errors can be subdivided into two groups. The first group **wos, sed, hed,** and **sum** all contain a single vowel which is used incorrectly, but which is a good representation of the sound heard. This could support the view that phonological encoding plays a key role in children's spelling (Read, 1980). It could also be argued that analogy lies at the root of these errors, particularly in the case of **sed, hed** and **sum.** These spellings could have been influenced by words such as **bed, fed, led, red,** and **gum, hum** and **mum. Sum** is also a homophone.

Each word in the second group, **ber, bers,** and **ther,** uses **er** incorrectly to represent the same phoneme in each instance. Although incorrect and non-analogous, this is consistent, and shows that children can invent, apply and use rules (even though these may not be valid) to help themselves represent ideas in print (Read, 1980). This consistency is quite remarkable as the Freq analysis showed that it occurs across all children in all schools. This example cannot be linked to analogy and the most likely explanation is phonological encoding or partially remembered visual representation.

7.8.4 Incorrectly spelt words in the ranking 100-200

If a further one hundred words are considered (i.e. those words

213

ranked 101-200), the incorrectly spelt words do not follow such similar patterns. Each of these further errors again represents a good phonetic alternative, but the errors do not fall into such distinct patterns.

The following table (7.8.II) puts the words in rank order (second column indicates ranking), shows the number of occurrences of each spelling (n) and offers some possible explanations for the errors.

TABLE 7.8.II INCORRECT SPELLINGS IN WORDS RANKED 100-200, WITH POSSIBLE EXPLANATIONS FOR ERRORS

WORD	RANK	n=	POSSIBLE EXPLANATION
trid [tried]	110	107	good phonetic alternative: correct use of consonants vowel represents letter name partial visual representation
cher [chair]	112	102	good phonetic alternative: correct use of consonants
porige (porridge]	113	102	good phonetic alternative: partial visual representation
thay [they]	115	98	good phonetic alternative: correct use of consonants vowel represents letter name partial visual representation possible analogy e.g. **day**
wen [when]	123	88	good phonetic alternative: correct consonants partial visual representation possible analogy e.g **pen, men**
wulf [wolf]	130	85	good phonetic alternative: short vowel sound partial visual representation possible analogy e.g.**gulf**
hiy [he]			correct consonant
hows [house]	137	80	good phonetic alternative: correct consonants **how + s**
grany [granny]	138	79	correct consonants partial visual representation correct representation of **gran**
siad [said]	140	79	partial visual representation transposition of letters

214

hose [who's]	144	77	partial visual representation (**whose**)
hud [hood]	145	77	good phonetic alternative correct consonants vowel digraph represented by short vowel sound analogy e.g.**mud** (in this region)
whent [went]	146	77	good phonetic alternative correct consonants over-generalisation of silent h analogy e.g.**when**
docter [doctor]	149	57	good phonetic alternative correct consonants analogy e.g.**teacher** partial visual representation
agen [again]	156	73	good phonetic alternative . correct consonants
porig [porridge]	165	69	partial visual representation
puld [pulled]	167	68	Reasonable phonetic alternative correct consonants partial visual representation
trad [tried]	168	68	good phonetic alternative correct consonants
bes [bears]	169	169	2/3 correct consonants
cem [came]	174	66	Reasonable phonetic alternative correct consonants partial visual representation
bere [bear]	176	65	good phonetic alternative correct consonants analogy (**there where**)
haws [house]	177	65	(spells **house**)
sur [saw]	182	61	Reasonable phonetic alternative
little [little]	184	60	good phonetic alternative correct consonants partial visual representation

215

cam [came]	188	58	correct consonants vowel represented by letter name partial visual representation
siy [she]	189	58	
dady [daddy]	192	57	correct representation of **dad**
siting [sitting]	195	56	correct representation of **sit** correct representation of **-ing**
thee [three]	197	55	partial visual representation correct representation of vowel digraph
ov [of]	199	54	good phonetic representation

These incorrect spellings are those most frequently used by children, but the Freq program can identify all incorrect spellings, which show a remarkable range of unconventional spellings. These do not all rely on phonological information or on the systematic application of rules, as the literature might suggest (e.g. Read, 1980). Rather, the findings matched those of Francis (1994), who conducted a longitudinal study which examined children's spelling in free writing.

"Such sampling yielded mis-spellings of both regular and irregular words representing inaccurate recall of familiar written words and partially successful construction of unfamiliar words. They were compiled from elements of similar known words, letter names, letter sounds and groups of letters for sounds. In no case did the sum of a child's spellings and mis-spellings indicate a reliance on recall or on construction alone. There was evidence of both for all children at all three testings. The measure selected for quantitative assessment of spelling error was the percentage of mis-spelled words in a written story. (Spelling accuracy was its obverse). This measure clearly did not show a linear relationship with age. The error percentage was higher on the third occasion of testing than on either the second or the

216

fourth. This might be expected if constructed spelling was attempted more than previously but not yet mastered as well as later, and if accurate recall was still limited to relatively few words"
(Francis, 1994, p.34).

7.8.5 Correct spellings in free writing

Theories of spelling would suggest that regular words can be spelled even if they have not been "learned" or committed to the lexicon. Such spellings can be assembled via phoneme/grapheme matching or by analogy, or can be retrieved from memory. Irregular words can only be reproduced correctly when their letter order has been committed to memory and is successfully and accurately retrieved from the lexicon. It might therefore be assumed that children would achieve more success with regular spellings than irregular spellings (e.g. Foorman, Francis, Novy and Liberman, 1991).

It follows, then, that the type of word which was spelt correctly is an important consideration. If all of the correctly spelt words were phonologically regular, this could support the view of many researchers (e.g. Read) that phonological processing plays a key role in spelling development. If, conversely, these words include some which could be classified as irregular, it would indicate that memory played a key role in early spelling.

Table 6.6.III listed the ten most frequently correctly spelt words on each occasion. This showed that the majority of the correctly spelt words could be classified as regular, particularly during the first year of schooling, although the number of irregular spellings did increase as the study progressed.

In the present study, the CHILDES analyses of the writing on occasions 2-9 formed a major part of the research. However, the writing on the first occasion took place during the autumn term in school. For most of the analyses conducted on the data, this occasion was not included as there are no samples for this term available for the second cohort. On the first occasion the first cohort were asked to write about themselves. As might be expected, this produced many samples which included family names (see data disks). The correct spelling of most names could

217

represent the logographic phase (Frith, 1980) and the possible use of eidetic memory. It might also support the findings of other researchers such as Treiman (1993).

A number of studies into memory have indicated that half the children studied had eidetic memory, though this fell off and became relatively rare after puberty. It would appear that many, if not all, young children would appear to see and remember eidetically, but lose this capacity as they get older (Rose, 1992). The writer would propose that this type of memory might account for the logographic stage of spelling referred to by Frith (1980). For children to learn words as complete units before they are able to apply grapho-phonemic rules to these might suggest a reliance on visual representation which links well with eidetic memory. This might also explain the ability of most young children to learn how to correctly represent their own names in an accurate manner (Tizard & Hughes, 1984; McNaughton, 1995). The fact that such representation is later superseded by the alphabetic approach would tie in with the loss of eidetic memory in later primary years, and this would relate to the changing approaches to spelling which are suggested by Gough & Juel (1991), Ehri (1987), and Frith (1980).

If this correct spelling of some words, particularly proper nouns, is *not* explained by the existence of eidetic memory, this ability of young children to spell certain words correctly may provide evidence of the way in which the lexicon develops. It is possible that the importance to the individual of particular words, such as names, provides the necessary impetus for such words to be committed accurately to the lexicon.

7.8.6 The range of words written

The range of the total number of words produced indicates the individual differences between children. This is unsurprising for those involved in primary education, but is worthy of note.

7.9 The spelling test (DV5)

From the literature review, children's performance on the spelling test could be predicted as follows.

218

1. If children adopt an alphabetic principle from the start, there should be a greater degree of accuracy in spelling regular words within the spelling test as these can be spelt by either the phonological or the lexical route

2. If similar numbers of regular and irregular words are spelt correctly this might suggest either the existence of the logographic stage (Frith, 1980) or a more complex approach to the development of correct spelling than has previously been put forward.

3. If lexicons are organised with some regard to frequency of use (e.g. Treisman, 1960; Adams, 1990), the most frequently occurring words would be spelt most accurately. This would be expected for both regular and irregular spellings.

4. If both regular and irregular words are correctly spelt, parallel processing may be occurring

5. If the mean number of correctly spelt words correlated with the number of incorrectly spelt words on Occasion A but not on Occasion C this might offer support for the importance of the phonological route. It might be assumed that, as phonological awareness develops and is applied to spelling, children are more likely to spell regular words correctly.

6. If the mean number of regular and irregular words are correlated on each occasion, this could indicate that words are being committed to a mental lexicon and can be spelt correctly regardless of orthographic regularity.

7. If invented spelling activity helps to develop phonological awareness and promotes understanding of the alphabetic principle (Adams, 1990, p.358), the children in schools adopting a developmental approach would have an advantage and might be expected to perform more successfully.

The results were considered with these points in mind. As with unaided writing, it was expected that scores would improve on successive occasions.

As described in Chapter 5, the spelling test contained ten regular and ten irregular words. As discussed in section 7.8.5, it might be assumed that children would achieve more success with regular spellings than irregular spellings due to the fact that regular words can be assembled or remembered, whereas irregular words can only be reproduced correctly when their letter order has been committed to memory and is successfully and accurately retrieved from the lexicon

Performance on the spelling tests would seem to indicate that regular spellings are learned earlier than irregular spellings, and this matches the findings of Foorman et al (1991) who found that all children in their study spelled regular words better than exception words. This finding does not indicate whether or not this means that the phonemic route is dominant, or whether this is the first strategy of lexical access to develop. The irregular words are learned less quickly, but some children write them correctly from the start.

If children spell regular words more accurately and earlier than irregular words, what does this show us? It may indicate that young writers rely on assembly, which would support the early and systematic teaching of letter/sound relationships. It may indicate that word frequency and familiarity are key issues, which would suggest support for the key words approaches adopted in many schools. It may indicate that lexical access is enhanced when both phonological and lexical information can be used, although frequency would have to be matched to make sure this was not just a lexical influence.

The correlations between the spelling of regular and irregular words is of interest, in that it indicates that children's ability to spell both types of word develops in tandem. This shows that the lexical route must play an important role during the infant years of education, as irregular words can only be correctly spelt if committed successfully to, and retrieved accurately from, memory. This offers support for the approaches to word study which are now implemented in schools as part of the National Literacy Strategy.

It has been suggested that the use of invented spelling might help

to develop phonological awareness and promote understanding of the alphabetic principle (Adams, 1990), thus giving children in those schools adopting a developmental approach an advantage which might lead them to perform more successfully. As the children in developmental schools were not more successful on the spelling test, this must be questioned.

In Clarke's study (1988), she found that both of her experimental groups (traditional and developmental spellers) had difficulty spelling orthographically irregular words on a spelling test (see 3.7.6). Similar findings can be demonstrated in this study. However, this study did not support Clarke's findings that children used to invented spelling were significantly more successful with regular spellings in the test than the group taught by a traditional approach.

These finding have implications for all teachers. The success of the traditional approach sub-set of children in relation to correct spelling could inform future teaching, if we can identify which aspects of the approach encouraged such success. As this success relates to regular and irregular spellings, it would seem likely that the attention to the visual aspects of spelling, or to the way words are committed to and stored in the lexicon which is contributing to this success, rather than the phonic teaching. If teachers can maximise word level study within infant classrooms, children should be able to make increasing use of a range of knowledge to support spelling.

7.9.1 Word difficulty

The actual order of difficulty which was found in relation to regular words does seem to occur in a logical order, with shorter words generally being found easier than longer words, and the consonant blends in **went** and **sand** proving easier than the digraph in **fish**. A closer analysis of the misspellings could shed further light on which parts of each word caused difficulties for the children, but this is beyond the scope of the present study.

TABLE 7.9.I TABLE SHOWING THE ACTUAL ORDER OF DIFFICULTY OF THE REGULAR WORDS IN THE SPELLING TEST.

ACTUAL ORDER
sat
went
sand
fish
window
garden
going
played
holiday
flowers

Table 6.5.IV showed the rankings of the regular words in the spelling test. The word **going** is seventh in order of difficulty on the first occasion, but ranks fifth on occasions b and c. This might reflect the freqency of its use. The spelling of **garden** is in sixth position in Reception, but apparently becomes harder for children to spell, moving to ninth and seventh in subsequent years. Again, this might relate to frequency, and could indicate either that the word **garden** is not one which is regularly used, or that some of the words which are ranked more highly are given closer attention.

The irregular words appear to be more difficult for children to spell accurately, particularly in the first year of schooling. The range of correct scores demonstrates the individual differences between children, which is well-known by teachers but is not always reflected in the setting of national standards and targets.

With regard to the irregular spellings in the test, the following order of difficulty was found (Table 7.9.II).

TABLE 7.9.II   TABLE SHOWING THE ORDER OF DIFFICULTY OF THE IRREGULAR WORDS IN THE SPELLING TEST.

ACTUAL ORDER
was
said
what
island
castle
people
friend
does
build
journey

The first three words are frequently used, and children's ability to spell these is perhaps unsurprising. The fact that **island,** with its silent letter, and **castle** are spelt more successfully than **friend** and **does** is of interest. The vowel digraphs may make these latter words more difficult for children, as the previous discussion has shown vowels to be less predictable in English spelling. The silent letter in **island** may actually make the word easier for children to remember, with the silent letter registering as a salient feature (Gough, Juel & Griffiths, 1992; section 3.6.5).

7.9.2 National Literacy Project

The National Literacy Project (1996) identifies a set of high frequency words to be taught in each year of infant education, thought the documentation offers no justification for these and no explanation of how they were selected. Seven of the NLP words were ones that had been included in the spelling test, so it was decided to consider whether the findings of this study matched the recommendations of the National Literacy Project.

The following table considers those NLP words which were included in the spelling test, and looks at how the children in the present study

coped with the accurate representation of these.

**TABLE 7.9.III TABLE INDICATING CHILDREN'S SUCCESS WITH
THOSE NLS REGULAR WORDS APPEARING IN THE SPELLING
TEST**

REGULAR SPELLINGS	NLS YEAR	% CORRECT OCC A	% CORRECT OCC B	% CORRECT OCC C
went	R	27	77	88
going	R	4	40	76
played	R	2	25	47

**TABLE 7.9.IV TABLE INDICATING CHILDREN'S SUCCESS WITH
THOSE NLS IRREGULAR WORDS APPEARING IN THE SPELLING
TEST**

IRREGULAR SPELLINGS	NLS YEAR	% CORRECT OCC A	% CORRECT OCC B	% CORRECT OCC C
was	R	22	68	89
said	R	7	27	56
what	Y1/2	2	16	47
people	Y1/2	0	6	27

It would appear from the evidence of this longitudinal study that the standards being set by the NLS are high, with regard to expecting children to correctly spell these words at the recommended ages. Of the regular words, **going** and **played** are supposed to be taught in Reception, yet had been mastered by very few children on Occasion A in the present study. **Played** and **said** remained challenging even at the end of Year 2. The NLP advice to teach these in Reception might result in children acquiring such spellings at an earlier age.

7.9.3 Discussion

The results of the spelling test in this study added an experimental element to the naturalistic approach (Treiman, 1990). The results obtained from the two elements of the study highlight a potential weakness in using the experimental approach alone. Successful performance on a spelling

test is generally taken to be an indicator that the spelling is "known" or has been committed to the lexicon. Many teachers know that this is a simplistic view, as short-term memory often assists children to do well in weekly spelling tests without such success being transferred to free writing. In the present study, the children were not able to prepare for the tests, so this element of pre-learning was not an issue. However, in this study it was possible to compare the spelling of the word **was** within both the experimental and the naturalistic elements of the study, and this comparison enables two conclusions to be drawn about the children's performance on the annual spelling tests.

- Children's spelling achievement cannot be judged accurately by considering their performance on one test occasion. 16% of children showed an ability to spell **was** correctly in either the test or the story writing on the same occasion, but could not apply this accuracy in the other form of writing (see charts in Appendix 14). Similarly this is illustrated by the lack of consistency shown by that proportion (22%) of children in the sample who wrote different forms of the spelling **was** within one writing sample.

- A correct spelling of a word does not guarantee that the spelling has been learned. 19% of children spelt the word **was** correctly on one or more occasions, but on subsequent occasions produced an inaccurate spelling.

The government's view is that spelling can be measured using such tests, and SAT results are now an important measure of performance. These results show that such confidence in test results is misplaced, and learning is too complex to be fully assessed by the use of spelling tests alone.

7.10 Revisting the theories and models of spelling

In this section, reference will be made to the main theories and models of spelling outlined in Chapter 3, Part B, and to the proposed theories of key researchers outlined in Chapter 3, Part C and the extent to which the present research provides support for these will be considered.

7.10.1 The phonological route to spelling

Several theories have centred on the view that phonology is central to early spelling, and this centrality was certainly supported by the present study. The importance of phonological knowledge to spelling cannot be denied. Until children begin to understand the relationship between sound and the conventional symbols used to represent these in writing, their spelling development must be limited.

It is clear from the evidence presented and from the discussion in section 7.8.5 that the type of word does affect the spelling process for children of 5 to 7 years of age (Foorman et al, 1991), with the phonologically regular words spelt more accurately than the irregular words on the spelling test. This indicates that young writers start to spell by drawing on their developing knowledge of phonology.

Read proposed the view that the invented spellings of young children are systematic, rule-governed and consistent, with phonological information providing the basis for this invention. The key role played by phonology was evident in this study, but the consistency and systematic spelling described by Read were not evident to the same extent as in his studies. The analysis and discussion in 7.8.3 offered some support for Read's theories with regard to misspellings, but the possible importance of the role of analogy brings into question the basis upon which children are making spelling choices or inventions. This may not be on grounds of phonology alone, and the role of analogy, whereby children use their existing knowledge of how similar sounding words are spelt, may also be key. Criticisms of Read's research included the fact that his sample was small and was not representative of the population as a whole. The larger, randomly selected sample in this study did not exhibit the same levels of systematic rule application and consistency Read outlined, and this might suggest that his conclusions are not applicable to all young children.

The evidence of this study, and particularly that of the spelling test, suggests that all children attempt to make use of available phonological knowledge, but not in the way defined in the pre-phonetic stage identified by

226

Gentry. For example, children seemed more likely to include vowels in their attempts than the Virginia School had indicated, and the final consonant was only important to half of the children on occasion 2. Gentry's predicted pattern of both consonants being represented with the vowel omitted was not found until the final occasion, and was only used twice in the whole study in the context of free writing.

Although a higher proportion of phonetically regular words was spelt more accurately than irregular words on the spelling test, the correlation which exists between the two sets of mean scores indicates that the relationship between the two remains constant over the years of infant education. Children do achieve greater overall success in spelling regular words, but this correlation might suggest that phonological development does not play as significant a role in children's spelling development as some researchers have suggested. Had this been the case, it might have been expected that the mean scores of regular and irregular words would not show significant correlation on Occasion C, when far greater phonological and alphabetic knowledge could be applied to the spelling of regular words.

The central role played by phonology in early spelling is confirmed, but the children in this study, as in that of Francis (1994), appear to use their knowledge of phonology and analogy in far more complex and individual ways than some research would suggest.

7.10.2 The lexical route to spelling

The existence of the lexical route is shown by children producing the conventional spelling of irregular words both in their free writing and in the spelling test. Those children who spelt the word **was** conventionally from the start (see Appendix 14) also demonstrated that lexical access plays a role in early spelling development, although the correlation between regular and irregular spelling scores (see 6.5.1. and Appendix 15) shows that the lexical route plays a less significant role for 5-7 year olds than the phonological route.

227

The role of a visual representation of the printed word in memory (see 3.5.8) is supported by the fact that a number of children produced spellings which were classified as possible visual errors, and some of these were correct spellings of other words which were then read as **was.** The Virginia model does not allow for this type of spelling, but the evidence supports the work of other researchers (e.g. Tenney, 1980; Hanna et al, 1966).

Gough and Juel's cipher theory (1991) suggested that visually distinctive elements play a key role in the development of spelling ability and this can be linked with Frith's (1980) view of the logographic stage of spelling. Children's success on the spelling test with words containing silent letters (e.g. **island**) may offer some support for the importance of visual distinctive features in spelling.

7.10.3 The role of the mental lexicon

With regard to the organisation of the mental lexicon, several interesting observations can be made. The analysis of **was** supports Perfetti's (1991,1992) theory of lexical development, with children moving from partial to complete lexical specifications. Some of the mis-spellings of **was** were actually alternative words (eg **went** and **what)** and this might indicate that words are stored within the lexicon in alphabetical order or frequency order and that words may be stored as complete units. The majority of mis-spellings suggest that phonology and visual memory both play roles in lexical organisation and retrieval.

Children did not adopt one consistent spelling of the word **was** during their writing on each occasion. 22% of children in the sample wrote different forms of the spelling within one writing sample. This would appear to imply that the spellings are being assembled on each occasion of production rather than being accessed from memory, or to offer support for Perfetti's (1991, 1992) model of lexical development, or Gough and Juel's (1991) cipher theory

The evidence from this study suggests that the lexicon stores

information in a number of different ways. Phonology plays an important role. Visual images appear to be stored, and the substitution of words such as went for was might indicate either an alphabetically or a frequency ordered store.

7.10.4 Do stages of development exist?

The word **was** was the most common incorrect spelling in this study, and in addition to being a high frequency word in general writing it was also included as an item in the spelling test. Although not written on every occasion by every child, the study provided a significant number of spellings of this word which can be analysed. The word was spelt correctly 1846 times, and incorrectly 301 times in free writing alone.

It was shown in Chapter 6 that the children in this study did not produce incorrect spellings which accorded with the developmental stages identified by the Virginia School in relation to the word **was**. The idea of stages of development, which has underpinned many recent educational publications, was called into question by several aspects of these findings.

Firstly, the assumption that all children begin to write by producing invented spellings must be challenged. Some 20% of children did not produce invented or non-conventional spellings, so did not go through the stages suggested by the Virginia school. The number of deviant spellings was very limited and a proportion of children wrote the word **was** correctly from the start (20%). This included a small number of children who wrote conventionally from Occasion 2, plus a much larger group who spelt **was** correctly from the first time their writing consisted of conventional letters (used either randomly or purposefully).

A further challenge to the idea of developmental stages is the fact that 19% of children spelt the word **was** correctly on one or more occasions, but on subsequent occasions produced non-standard spelling(s) of the word. These non-standard spellings following the correct representation of the word could have been 'slips of the pen' (Chapter 3) but might also indicate that the conventional spelling is not automatic or "fixed" in the lexicon in the early

stages of writing.

On the final occasion of each year, children completed the writing task and undertook the spelling test. Some children were not consistent between the two tasks. This lack of consistency on the same day might support the conclusion that words take some time to become "fixed" in the lexicon, but it may also indicate that the demands of the task or the context of the writing plays a significant role. The amount of effort required by the writing task will affect the attention that can be given to the spelling of each word. For example, a spelling which can be automatically and accurately retrieved from the lexicon during a spelling test may prove more (or less) difficult for an individual child when the word is being written as part of a narrative which is requires to be composed.

7.11 Implications for pedagogy

This research set out to study children's spelling development in relation to the approach to teaching writing and spelling professed by schools and to seek classroom evidence through which to explore whether certain spelling theories could be supported. Although the approach to the teaching of writing professed by schools did not lead to major differences in children's performance within this study, it must be remembered that during the three years of this research, national and local initiatives were altering classroom practice.

The series of developmental stages proposed by the Virginia School have been referred to as fact in several educational publications (Chapter 3) and have been integrated into the language policies of some schools. The analysis of the word **was** within the present study failed to offer full support for the existence of such discrete stages, and Ehri's more complex model of lexical development (3.6.7) would appear to provide the model closest to reality. She suggests that children begin with a non-alphabetic phase, followed by a partial alphabetic phase when children are "linking the most salient letters to sounds" (1995,p.117), followed by a full alphabetic phase where these full connections are made. Finally the consolidated

230

alphabetic, which equates with Frith's orthographic phase, enables children to present spellings which are more conventional.

In addition, the evidence (e.g. Appendix 14) shows that both phonological and visual strategies play a role in the children's spelling, with phonological influences playing the major role. However, these phonological strategies were less predictable and more wide-ranging than the Virginia School's proposed developmental stages suggest. Children use a range of invented spellings. This individuality reflects the findings of Francis (1994) far more than those of Read (1986) or Gentry (1991).

> "Studies of cognition suggest that there exist many different ways of acquiring and representing knowledge; these individual differences need to be taken into account in our pedagogy as well as in our assessments"
> (Gardner, 1993, p.14)

It is clearly important that teaching approaches take account of these individual differences, and enable all children to develop a full range of strategies to support the development of conventional spelling. Individuals need to develop both phonological and visual strategies, and to acquire a knowledge of morphology which can help to enhance lexical entries. Word study will also help writers to make greater use of analogy.

7.12 Replication of this study

At the time this study began, there were a number of discernible approaches to the teaching of writing in different infant schools. The introduction of the English National Curriculum had an impact on classroom practice in the teaching of writing, and required a gradual change in approach. This, in some cases, led to schools and teachers having to adopt pedagogical practices which were not ideologically their own. The prescription has continued with the introduction of the National Literacy Strategy. Although individual teachers may still vary in the emphasis they place on various aspects of teaching and learning, it is unlikely that dramatic differences will exist in

relation to pedagogical approaches.

There has also been a change relating to the admissions policies adopted by most LEAs and schools, which means that all children tend to start school at the age of four. This means that the cohort element of the present study could not be replicated, although age (and maturity) as a significant factor is worthy of further examination.

For these reasons the study may not be totally replicable, but as the debate about the effectiveness of literacy teaching continues, a study which considered different teaching methods is of great interest to the profession.

7.13 Conclusion

Current theories of spelling, particularly those which describe stages of development, seem too simplistic to explain the complexity of the spelling process. Although children do rely heavily on phonological encoding when they start to write (Read 1986), the clear stages identified by Gentry (1991) and others were not seen in this study. Several aspects of children's writing suggest greater complexity. Firstly, proper nouns such as family names or street names are correctly spelt from the first occasion. Secondly, visual memory appears to play a role in spelling development. Thirdly, the errors within non-conventional spellings could possibly be influenced by analogy (Ehri, 1994). Children's ability to write depends both on their knowledge of the orthographic system and on the nature of the word which is to be spelt. Children do not all approach the process in the same way or progress at the same rate. Rather, within each sample of writing children appear to be operating in a number of different ways with different words, or even in different ways with the same word (for example, see Appendix 14).

The conclusions which can be reached about why children spell a particular word in a particular way can only be supposition and would merit further research. Having been able to record the vocalisations which occurred on some occasions, it is clear that the written evidence alone cannot provide a

232

full picture of cognitive ability or the reasons for errors. Unconventional spellings offer a great deal of information about children's understanding of print and how it works, but the various `sub-skills' identified in part one of Chapter 3 can each be responsible for a number of different mis-spellings. For example, an unconventional spelling may reflect any number of different aspects of understanding in the child such as:

- the child's inability to hear the constituent sounds of the word
- the child's ability to hear the constituent sounds of the word, and a lack of understanding that graphemes can correspond with these sounds
- the child's ability to hear the constituent sounds of the word, and an understanding that graphemes can correspond with these sounds, but a lack of knowledge of how to represent the identified phonemes with appropriate graphemes
- the child's ability to hear the constituent sounds of the word, and the knowledge of the matching graphemes with which to represent these sounds, but poor physical control which results in the reversal of 'b'
- the child's ability to hear the constituent sounds of the word, and the knowledge of the matching graphemes with which to represent these sounds, but a slip of the pen (perhaps caused by the amount of attention needed to recreate the story) results in the omission of a key letter
- the child's inability to retrieve the correct spelling of a familiar word from memory.

These levels of understanding may be demonstrated by one writer in relation to different words, reflecting the fact that each instance of written language use is "an orchestration of a complex social event" (Harste, Woodward, and Burke, 1991. p 61). This orchestration includes the generation and testing of new hypotheses in relation to the following:

- pragmatics (what the rules of language use are relative to a particular context)

-semantics (how to say what I mean)

-syntax (how to get the flow of message on paper)

-graphics (how to represent what I want to say) and the

-orchestration of these (how I draw on each system simultaneously)

Within each area the writer has to formulate and fit a range of hypotheses, and additional hypotheses arise as the user orchestrates more and more elements of the writing task. To a reader of the writing this might look like regression, but it is in fact representing growth. Growth, while constant, looks sporadic.

CHAPTER 8: CONCLUSIONS

8.1 Similarities and differences

The similarities between children are more remarkable than the differences. Children select a similar range of words to use, and tend to spell the same words correctly. This was evident across six schools professing three different approaches to the teaching of writing. Boys and girls wrote using a similar range of words, and so did the two different cohorts, although the cohorts varied in the amount of writing and the number of words used.

8.2 Range

The range of words written was found to be wide, in both the naturalistic and experimental aspects of the research. Teachers know this to be the reality of the infant classroom, but the current national initiatives do not take this into account. The National Literacy Strategy determines, for example, the phonic work to be undertaken in Year 1, term 2 for all children, implying that the learning needs of all children are similar.

There are extensive differences between children in terms of the words they use in their writing, and in the number of correct words they can spell. This underlines the challenges facing teachers of 4-7 year olds and raises serious questions about the appropriateness of the current testing system at 7 years of age.

8.3 Writing topics

The results show that the writer's familiarity with the tale might have an effect on the quality of a narrative re-writing. This offers support for the idea postulated by Graves (1983) that writing consists of two elements -the compositional and secretarial. When the compositional demands are reduced, that is, when children are already familiar with the narrative, then the secretarial process can receive more attention. This knowledge should inform the way in which young writer's secretarial skills are assessed, particularly in relation to assessments which facilitate national comparisons.

235

8.4 Regular and irregular words

Regular words in the spelling test were written more successfully than the irregular words. Irregular words need to be committed to and retrieved from memory, whereas regular words can either be remembered or assembled. The fact that children achieved greater success with regular spellings shows that irregular spellings are more difficult to present conventionally. The correlation between the children's success in regular and irregular spelling indicates that, although phonological processing is undoubtedly important to early spelling, children are also developing efficient retrieval systems which relate to irregular spellings.

8.5 Gender

No significant difference was found between the performance of boys and girls.

8.6 Occasion

Children improved their writing ability by occasion in relation to the number of words used, the number of different words used, and the degree to which these were spelt conventionally. A particular spurt in development was noticeable between occasion 6 and 7, for which no straightforward explanation can be made. This period of time appears to be significant in children's writing development and merits further study.

8.7 Individual differences

The results seem to show that children approach spelling and learning to write in individual ways, perhaps as they do learning to speak and making sense for themselves of a complex process. Writing essentially involves learning to communicate through print in a way which can be understood by a reader. The two main strands of this involve learning about the message concept and learning how to represent speech in symbolic form. Featural and functional understanding of print are both necessary, but the two appear to develop independently of each other, with children gradually moving along the diagonal of two continua. Individual children vary greatly in terms of both developments. The message concept appears fully developed after a year

236

of schooling. Further work is needed to support our understanding of how the functional understanding of print develops in relation to the featural.

> "Another leitmotif emerging from recent cognitive
> research, however, documents the extent to which
> students possess different kinds of minds and
> therefore learn, remember, perform, and understand
> in different ways" (Gardner, 1993, p.10).

8.8 Routes to spelling

The clear division proposed by some researchers relating to either lexical or non-lexical routes does not appear to be supported. Evidence in this study of the possible use of analogy in assembled spellings supports Ehri's view that the distinction is not so clear cut. It could be that there is a series of parallel and connected routes (e.g. Adams, 1990) and depending on our learning styles, the strength with which we have committed certain words to memory and the extent of our ability to use morphemic and lexical knowledge we can make use of those routes as and when we need them.

This would match some recent views on the development of reading models. For example, Reason (1990) says of her model of reading

> "it implies that the acquisition of reading can proceed
> in different ways according to the learning
> opportunities, cognitive make-up and particular
> strategies of the individual" (Reason, 1990, p.53).

This model would also appear to be applicable to writing and would seem to fit with models of lexical development which have been described (Ehri, 1991,1994: Gough & Juel, 1991; Perfetti, 1991,1992). Perfetti's (1992) model of how the lexicon might develop would seem to be supported by the evidence presented in Chapters 6 and 7, and the study upholds Francis' (1994) findings relating to the range of behaviours exhibited by young writers.

The writer's view is that, just as with spoken language each child

has to "discover" its own grammar, so in spelling each child has to develop its own orthography. This will start with invention which will reflect the writer's growing level of understanding, and will move to convention as children learn the communicative, alphabetic, graphic, morphological and syntactic aspects of print. This development will depend on exposure to writing in the way that grammar is influenced by the speech culture. With the help of an informed and literate population, and with the natural desire to make sense of the world, each child will develop an understanding of the functional and the featural aspects of print during the three years of infant education.

8.9 Teaching Approach

The professed teaching approach adopted by schools was found to have no significant influence on all aspects of children's writing and spelling development. No one approach to the teaching of writing was shown to be significantly more successful than another across all of the dependent variables, but the information gained from this study about the progress children make in spelling indicates that children seem to develop as writers in complex ways (Francis, 1994). Children made progress in similar ways and at similar rates across all schools and approaches in the study. These ways which are similar regardless of sex, cohort or approach to teaching.

All children in this study experienced independent writing and the associated need to draw on their memories of words, or their mental lexicons. The initial approach to the teaching of writing, particularly in the Reception year, did differ between the three categories within the study, but all schools implemented the National Curriculum and adopted generative approaches to writing during the time of the study. It is difficult to establish to what extent the three categories remained different by the conclusion of this research.

Children develop as writers irrespective of the approaches professed by schools, although the teaching approach adopted within school does have some influence on the development of correct spelling in children.

8.10 A final note

Knowing how to spell words correctly is of little value unless the writer is interested in their use. The purpose of writing is to record or convey meaning, and the purpose of conventional spelling is to assist in the ease of transmission of this meaning from author to audience. Although this research has focused on the children's development from spelling invention to spelling convention, this progress was studied within story structure. It should be noted that the young writers in this study demonstrated an improving ability to spell alongside the ability to narrate stories and to entertain the reader. My thanks go to them all.

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247

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257

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CONTENTS OF APPENDICES

APPENDIX 1: QUESTIONNAIRE

<u>TEACHING YOUNG CHILDREN TO WRITE</u>

Learning to write has two major aspects. One is the mechanics of letter formation. The second is the ability to express ideas in writing. THIS STUDY IS CONCERNED ONLY WITH THE SECOND OF THESE.

		YES	NO
1.	(a) Does your school have a written policy statement on the development of literacy?	☐	☐
	(b) If the answer to (a) is YES, does this include a section on the teaching of writing?	☐	☐
	(c) If the answer to (a) is NO, please complete Question 2.		
2.	(a) Does your school have an agreed approach (an unwritten policy) to the development of literacy?	☐	☐
	(b) If the answer to (a) is YES, does this include an agreement on the teaching of writing?	☐	☐

The teaching of writing can be considered as a continuum between 'traditional' and 'developmental' methods as outlined below.

Traditional – teacher scribes the child's ideas. The child learns to write by overwriting and/or copywriting.

Developmental – child scribes own ideas, regardless of his/her level of competence/accuracy. Child learns to write by experimentation.

---

3. Where would you place your school's approach to the initial stages of writing on the scale below? (Please indicate with cross).

Traditional   Eclectic   Developmental
(50% traditional / 50% developmental)

Name of School ....

265
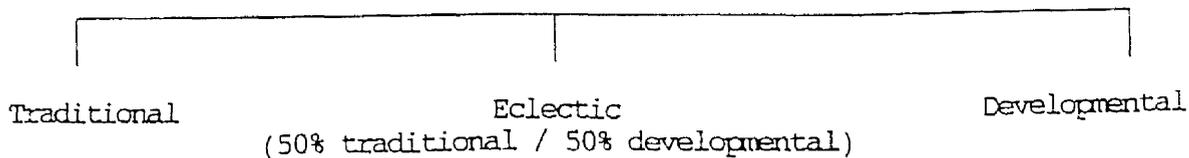
APPENDIX 2: DATA DISKS

See inside of back cover.

A3: CHILDES PROGRAMS

CHILDES consists of three separate but integrated tools. CHAT is the transcription and coding format, CLAN is the package of analysis programs, and CHILDES is the data base itself. CLAN has many related programs which can be used to analyse data. The list of programs within CLAN which were appropriate to the present study is as follows:

CHECK   Verifying data accuracy.

COMBO   Searches a file for a regular expression.

FREQ   Gives a word frequency count.

KWAL   Creates a keyword and line concordance- provides many options.

MAXWD   Locates, measures and prints the longest word or line in text.

MLT   Calculates the mean length of turn in a file.

MLU   Calculates the mean length of utterance in a file.

STATFREQ   Outputting to statistical analyses.

WDLEN   Tabulates word and utterance lengths and prints a histogram.

Those which were used in the present study are detailed below. For further details see MacWhinney (1991).

CHECK -- verifying data accuracy

The CHECK program checks the syntax of the specified CHAT files. It makes two passes through each CHAT file. On the first it checks the overall structure of the file, making sure that it begins with @Begin and ends with @End, that each line starts with either *, @, %, or a tab, and that colons are used properly with main lines, dependent tiers, and headers that require entries. The second pass checks the detailed structure of the file.

FREQ -- making frequency counts

The FREQ program constructs a frequency word count for user-specified files. A frequency word count calculates the number of times a word, as delimited by a punctuation set, occurs in a file or set of files. It produces a list of all the words used in the file, along with their frequency counts, and calculates a type-token ratio. The type-token ratio is found by calculating the total number of unique words used by a selected speaker or group of speakers (or a writer in the present study) and dividing that number by the total number of words used by the same speaker(s). It is generally

used as a rough measure of lexical diversity. It can only be used to compare samples of equivalent size, since, as sample size increases, the increase in the number of types starts to level off. For this reason the type-token ratio information is not presented in the present study and freq is used for frequency alone.

Limiting in FREQ

Limiting allows the analysis of some specific part of the data as opposed to all of the data found in the file. One of these analyses, limiting to dependent tiers, was relevant to the present study. The use of the +t /-t options, enables the inclusion of certain dependent tiers and the exclusion of others.

The options for FREQ which are relevant to this study are:

1. +c: Find capitalized words only.

2. +d: Perform a particular level of data analysis. By default the output consists of all selected words found in the input data file(s) and their corresponding frequencies. The +d option can be used to change the output format.

+d0: When the +d0 option is used, the output consists of all selected words found in the input data file(s), their corresponding frequencies, and line numbers where each word is located in the file.

3. +f/-f: Send output to the screen or to a file. The default value of this switch is -f which sends output to the screen. The +f switch must be used to send the output to a file. The letters placed after the +f become the file extension name.

4. +i/-i: Use a file of words to be examined.

5. +o: Normally, the output from FREQ is sorted alphabetically. This option can be used to sort the output in descending frequency.

6. +s/-s: This option, directly followed by a word, allows the user to determine the frequency of that particular word in a file. The +i switch cannot be combined with -s and the -i switch cannot be combined with +s.

7. +t/-t: Particular dependent tiers can be included or excluded by using the +t option immediately followed by the tier code.

8. +u: By default, when the user has specified a series of files on the command line, the analysis is performed on each individual file. If the +u option is used, the program combines the data found in all the specified files into one set and outputs the results for that set.

9. +z: Work on a specified range of words or utterances.

KWAL -- key word and line

The KWAL program outputs tiers which contain user-specified keywords. This program allows the user to view the context in which any given keyword is used. There are two ways to specify these keywords. The use of the +i/-i option searches for keywords in a specific data file. It can search for a number of keywords at the same time and can search for a large number of keywords in context, such as all personal pronouns. The +s option searches for the keywords themselves, with the +s option immediately followed by the keyword wanted. It is possible to specify many +s options on the command line.

The options for KWAL are:

1. +d: When this option is set, the output consists only of those utterances which match the KWAL search string, one per line. This option would be helpful to see the use of the word in context without further reference, or to send the output of the file to another program for further analysis.

2. +f/-f: Send output to the screen or to a file, with the letters placed after the +f becoming the file extension name.

3. +k: Make analyses case sensitive.

4 +s/-s: This option is used to specify a word to search for in a given data line(s). This option should be immediately followed the word itself.

5. +t/-t: Specifies which main speaker and its dependent tiers, if any, are to be included in the cluster tier. Main lines can be excluded using the -t* switch. To search for a keyword on the *CHI main speaker tiers and the %err dependent tiers of that speaker only, include +t*CHI +t%err on the command line.

6. +u: Treat the specified files as one combined file.

7. +z: Work on a specified range of words or utterances.

8. +i/-i: Take words to be used from an input file.

MLT -- mean length of turn

The Mean Length of Turn program computes the number of utterances, turns and their ratio. MLT is widely considered to be a measure of the level of language development. As the present study relates to written language, these measures are not appropriate or relevant. However, the information provided by MLT can be used in a limited way. When a group of files is selected for analysis, for example, girls in cohort 1 across all 6 schools, the first of the result lines

Ratio of words over turns = 28

would give the average length of words within the stated subset of files.

269

The options for MLT which are relevant to this study are:

1. +f/-f: Send output to the screen or to a file.
2. +i/-i: Take words to be used from an input file.
3. +s/-s: This option is used to specify a word to be used from an input file.
4. +u:. : Treat the specified files as one combined file.
5. +z: Work on a specified range of words or utterances.

WDLEN -- graphs of word length

The WDLEN reads through data files, tabulating the frequencies of various word and utterance lengths and prints a histogram. The output consists of word lengths (in characters) and utterance lengths (in words), the frequencies of these lengths, and a histogram of these frequencies.

The basic use of the WDLEN program is as follows:

wdlen sample.cha

The options for WDLEN are:

1. +f/-f: Send output to the screen or to a file.
2. +t/-t: Include/exclude dependent tiers.
3. +u:. : Treat the specified files as one combined file.
4. +z: Work on a specified range of words or utterances.

APPENDIX 4: CODING KEY

Variable number	Column number	Variable description	Variable coding
	1,2,3	Pupil reference number	001-227
LINE 1	4	Line number	1-4
1	5	Sex	1= male 2= female
2	6	Cohort	1= September 2= January
3	7	School	1= School T1 2= School T2 3= School E2 4= School E1 5= School D1 6= School D2
4	8	Approach nominated by school	1= traditional 2= eclectic 3= developmental
5	9	Occasion1:overall classification of writing	0-6 0= drawings only 1= drawings + non-conventional symbols/ letter-like forms 2= drawings + standard letters/numbers used randomly 3=non-conventional symbols only 4=non-conventional symbols +some standard letters/numbers 5= standard letters/ numbers used randomly 6=standard letters used conventionally 9= missing data
6	10	Occasion 1: Message concept	0= no message assigned 1= message assigned 9= missing data
7	11,12,13	Occasion 1: total number of words used	000-700 999=missing data
8	14,15,16	Occasion 1: total number of different words used	000-300 999=missing data
9	17,18,19	Occasion 1: total number of correctly spelt words	000-600 999=missing data

LINE 1 10	20,21,22	Occasion 1: total number of different correctly spelt words used	000-300 999=missing data
11	23	Occasion 2: overall classification of writing	0-6 9=missing data
12	24	Occasion 2: message concept	0= no message 1= message assigned 9= missing data
13	25,26,27	Occasion 2: total number of words used	000-700 999= missing data
14	28,29,30	Occasion 2: total number of different words used	000-300 999= missing data
15	31,32,33	Occasion 2: total number of correctly spelt words	000-600 999= missing data
16	34,35,36	Occ2: total number of different correctly spelt words	000-300 999= missing data
17	37	Occ 3: overall classification of writing	0-6 9= missing data
18	38	Occ 3: message concept	0= no message 1= message assigned 9= missing data
19	39,40,41	Occ 3: total number of words used	000-700 999= missing data
20	42,43,44	Occ 3: total number of different words used	000-300 999= missing data
21	45,46,47	Occ 3: total number of correctly spelt words	000-600 999= missing data
22	48,49,50	Occ 3: total number of different correctly spelt words	000-300 999= missing data
23	51	Occasion 4: overall classification of writing	0-6 9= missing data
24	52	Occasion 4: message concept	0= no message 1= message assigned 9= missing data
25	53,54,55	Occasion 4: total number of words used	000-700 999= missing data
26	56,57,58	Occasion 4: total number of different words used	000-300 999= missing data

Line 1	59,60,61	Occasion 4: total number of correctly spelt words used	000-600 999= missing data
27			
28	62,63,64	Occasion 4: total number of different correctly spelt words used	000-300 999= missing data
29	65	Occasion 5: overall classification of writing	0-6 9= missing data
30	66	Occasion 5: message concept	0= no message 1= message assigned 9= missing data
31	67,68,69	Occasion 5: total number of words used	000-700 999= missing data

Variable number	Column number	Variable description	Variable coding
Line 2	1,2,3	pupil reference number	001-227
32			
33	4	line number	2
34	5,6,7	occasion 5: total number of different words used	000-300 999=missing data
35	8,9,10	Occasion 5: total number of correctly spelt words used	000-600 999=missing data
36	11,12,13	Occ 5: total number of different correctly spelt words	000-300 999=missing data
37	14	Occ 6: overall classification of writing	0-6 9=missing data
38	15	Occ 6: Message concept	0= no message 1= message 9= missing data
39	16,17,18	Occ 6: total number of words	000-700 999= missing data
40	19,20,21	Occ 6: total number of different words used	000-300 999=missing data
41	22,23,24	Occ 6: total number of correctly spelt words used	000-600 999= missing data
42	25,26,27	Occ 6: total number of different correctly spelt words used	000-300 999=missing data
43	28	Occ 7: overall classification of writing	0-6 9=missing data

Line 2 44	29	Occasion 7: Message concept	0= no message 1= message 9= missing data
45	30,31,32	Occ 7: total number of words	000-700 999= missing data
46	33,34,35	Occ 7: total number of different words used	000-300 999= missing data
47	36,37,38	Occ 7: total number of correctly spelt words used	000-600 999=missing data
48	39,40,41	Occ 7: total number of different correctly spelt words	000-300 999=missing data
49	42	Occ 8: overall classification of writing	0-6 9=missing data
50	43	Occ 8: Message concept	0= no message 1= message 9= missing data
51	44,45,46	Occ 8: total number of words used	000-700 999=missing data
52	47,48,49	Occ 8: total number of different words used	000-300 999= missing data
53	50,51,52	Occ 8: total number of correctly spelt words used	000-600 999= missing data
54	53,54,55	Occ 8: total number of different correctly spelt words used	000-300 999=missing data
55	56	Occ 9: overall classification of writing	0-6 9= missing data
56	57	Occ 9: Message concept	0= no message 1= message assigned 9= missing data
57	58,59,60	Occ 9: total number of words used	000-700 999= missing data
58	61,62,63	Occ 9: total number of different words used	000-300 999= missing data
59	64,65,66	Occ 9: total number of correctly spelt words used	000-600 999= missing data
60	67,68,69	Occ 9: total number of different correctly spelt words used	000-300 999= missing data

274

Variable number	Column number	Variable description	Variable coding
	1,2,3	Pupil reference number	001-227
	4	Line number	3
Line 3 61	5,6	Occasion a: Spelling test Total correct	00-20 99= missing data
62	7	Occasion a: Spelling test word 1	1=incorrect 2=correct 9=missing data
63	8	occasion a: spelling test word 2	1=incorrect 2=correct 9=missing
64	9	occasion a: spelling test word 3	1=incorrect 2=correct 9=missing data
65	10	occasion a: spelling test word 4	1=incorrect 2=correct 9=missing data
66	11	occasion a: spelling test word 5	1=incorrect=1 2=correct 9=missing data
67	12	occasion a: spelling test word 6	1=incorrect 2=correct 9=missing data
68	13	occasion a: spelling test word 7	1=incorrect 2=correct 9=missing data
69	14	occasion a: spelling test word 8	1=incorrect 2=correct 9=missing data
70	15	Occasion a: spelling test word 9	1=incorrect 2=correct 9=missing data
71	16	Occasion a: spelling test word 10	1=incorrect 2=correct 9=missing data
72	17	Occasion a: spelling test word 11	1=incorrect 2=correct 9=missing data
73	18	occasion a: spelling test word 12	1=incorrect 2=correct 9=missing data

74	19	occasion a: spelling test word 13	1=incorrect 2=correct 9=missing data
75	20	occasion a: spelling test word 14	1=incorrect 2=correct 9=missing data
76	21	occasion a: spelling test word 15	1=incorrect 2=correct 9=missing data
77	22	occasion a: spelling test word 16	1=incorrect 2=correct 9=missing data
78	23	occasion a: spelling test word 17	1=incorrect 2=correct 9=missing data
79	24	occasion a: spelling test word 18	1=incorrect 2=correct 9=missing data
80	25	occasion a: spelling test word 19	1=incorrect 2=correct 9=missing data
81	26	occasion a: spelling test word 20	1=incorrect 2=correct 9=missing data
82	27,28	occasion b: spelling test total correct	00-20 99=missing data
83	29	occasion b: spelling test word 1	1=incorrect 2=correct 9=missing data
84	30	occasion b: spelling test word 2	1=incorrect 2=correct 9=missing data
85	31	occasion b: spelling test word 3	1=incorrect 2=correct 9=missing data
86	32	occasion b: spelling test word 4	1=incorrect 2=correct 9=missing data
87	33	occasion b: spelling test word 5	1=incorrect 2=correct 9=missing data

Line 3 88	34	occasion b: spelling test word 6	1=incorrect 2=correct 9=missing data
89	35	occasion b: spelling test word 7	1=incorrect 2=correct 9=missing data
90	36	occasion b: spelling test word 8	1=incorrect 2=correct 9=missing data
91	37	occasion b: spelling test word 9	1=incorrect 2=correct 9=missing data
92	38	occasion b: spelling test word 10	1=incorrect 2=correct 9=missing data
93	39	occasion b: spelling test word 11	1=incorrect 2=correct 9=missing data
94	40	occasion b: spelling test word 12	1=incorrect 2=correct 9=missing data
95	41	occasion b: spelling test word 13	1=incorrect 2=correct 9=missing data
96	42	occasion b: spelling test word 14	1=incorrect 2=correct 9=missing data
97	43	occasion b: spelling test word 15	1=incorrect 2=correct 9=missing data
98	44	occasion b: spelling test word 16	1=incorrect 2=correct 9=missing data
99	45	occasion b: spelling test word 17	1=incorrect 2=correct 9=missing data
100	46	occasion b: spelling test word 18	1=incorrect 2=correct 9=missing data
101	47	occasion b: spelling test word 19	1=incorrect 2=correct 9=missing data
102	48	occasion b: spelling test word 20	1=incorrect 2=correct 9=missing data

103	49,50	occasion c: spelling test total correct	00-20 99=missing data
104	51	occasion c: spelling test word 1	1=incorrect 2=correct 9=missing data
105	52	occasion c: spelling test word 2	1=incorrect 2=correct 9=missing data
106	53	occasion c: spelling test word 3	1=incorrect 2=correct 9=missing data
107	54	occasion c: spelling test word 4	1=incorrect 2=correct 9=missing data
108	55	occasion c: spelling test word 5	1=incorrect 2=correct 9=missing data
109	56	occasion c: spelling test word 6	1=incorrect 2=correct 9=missing data
110	57	occasion c: spelling test word 7	1=incorrect 2=correct 9=missing data
111	58	occasion c: spelling test word 8	1=incorrect 2=correct 9=missing data
112	59	occasion c: spelling test word 9	1=incorrect 2=correct 9=missing data
113	60	occasion c: spelling test word 10	1=incorrect 2=correct 9=missing data
114	61	occasion c: spelling test word 11	1=incorrect 2=correct 9=missing data
115	62	occasion c: spelling test word 12	1=incorrect 2=correct 9=missing data
116	63	occasion c: spelling test word 13	1=incorrect 2=correct 9=missing data
117	64	occasion c: spelling test word 14	1=incorrect 2=correct 9=missing data

Line 3 118	65	occasion c: spelling test word 15	1=incorrect 2=correct 9=missing data
119	66	occasion c: spelling test word 16	1=incorrect 2=correct 9=missing data
120	67	occasion c: spelling test word 17	1=incorrect 2=correct 9=missing data
121	68	occasion c: spelling test word 18	1=incorrect 2=correct 9=missing data
122	69	occasion c: spelling test word 19	1=incorrect 2=correct 9=missing data
123	70	occasion c: spelling test word 20	1=incorrect 2=correct 9=missing data

Variable number	Column number	Variable description	Instructions	Variable coding
	1,2,3	pupil number		
	4	line number		
Line 4 124	5,6	Occ a Spelling test: Total number of regular words	Total number of 2s in line 3, columns 7,8,14, 15, 16,17,20,21, 22,25	00-10 missing data=99
125	7,8	Occ a Spelling test: Total number of irregular words	Total number of 2s in line 3, columns 9,10,11, 12,13,18,19, 23,24,26	00-10 missing data=99
126	9,10	Occ bSpelling test: total number of regular words	Total number of 2s in line3, columns 29,30,36, 37,38,39,42,43,44,47	00-10 missing data=99
127	11,12	Occ b Spelling test: Total number of irregular words	Total number of 2s in line 3,columns 31,32,33, 34,35,40,41,45,46,48	00-10 missing data=99
128	13,14	Occ c Spelling test:Total number of regular words	Total number of 2s in line 3, columns 51-2, 53,5-61,64,65,66,69	00-10 missing data=99
129	15,16	Occ c Spelling test: total number of irregular words	Total number of 2s in line 3,columns 53,54,55, 56,57,62,63,67,68,70	00-10 missing data=99

APPENDIX 5:   EXAMPLE OF CHILDES CODED TEXT

```
@Begin:
@Author:            IAB
@Filename:          0822321
@Sex:               MALE
@Cohort:            2
@School:            3
@Activities:        rewriting The Trunk
@Date:              25/3/93
@Occasion:          5
```

```
*CHI:       the srerirl[*] went up the thee[*] and the cat went up
%eng:       the squirrel went up the tree and the cat went up
%err:       srerirl=squirrel; thee=tree;

*CHI:       the thee[*] and the meoc[*] went up the thee[*]
%eng:       the tree and the monkey went up the tree
%err:       thee=tree; meoc=monkey; thee=tree;

*CHI:       it was the ereets[*] threk[*] and the ereet[*]
%eng:       it was the elephant's trunk and the elephant
%err:       ereets=elephant's; threk=trunk; ereet=elephant;

*CHI:       got his threk[*] dwein[*] and uool[*] the anrnm[*]
%eng:       got his trunk down and all the animals
%err:       threk=trunk; dwein=down; uool=all; anrnm=animals;

*CHI:       went dein[*]
%eng:       went down
%err:       dein=down;
```

```
@End:
```

APPENDIX 6: Coding Key for Spelling Test Pilot.

Variable	Column Number	Variable description	Variable coding
	1,2	pupil reference number	00-26
1	3	Sex	boy=1, girl=2
2	4,5	occasion 1: total number of correctly spelt words	00-20 missing data=99
3	6,7	occasion 2: total number of correctly spelt words	00-20 missing data=99
4	8,9	occasion 1: total number of regular words correctly spelt	00-10 missing data=99
5	10,11	occasion 1: total number of irregular words correctly spelt	00-10 missing data=99
6	12,13	occasion 2: total number of regular words correctly spelt	00-10 missing data=99
7	14,15	occasion 2: total number of irregular words correctly spelt	00-10 missing data=99
8	16	S.A.T. reading result 1992	1-7 Level 1 =1 Level 2E=2 Level 2D=3 Level 2C=4 Level 2B=5 Level 2A=6 Level 3 =7 missing data=9
9	17	S.A.T. spelling result 1992	1-5 Level 1 =1 Level 2 =2 Level 3C=3 Level 3B=4 Level 3A=5 missing data=9
10	18	S.A.T. writing result 1992	1-3 Level 1=1 Level 2=2 Level 3=3 missing data=9

APPENDIX 7: CHILDREN LEAVING STUDY, BY APPROACH AND GENDER

As explained in Chapter 5, the study was designed to compare the relationship between teaching approach and the development of writing. Any child who left the research schools or who was admitted to the schools after the start of the study was excluded from the research. A total of 31 children left during the study. The following table shows the distribution of those leaving by approach and gender.

CHART A7: CHILDREN LEAVING RESEARCH SCHOOLS DURING THE STUDY.

	MALE	FEMALE	TOTAL LEAVING
DEVELOPMENTAL APPROACH	7	3	10
ECLECTIC APPROACH	4	7	11
TRADITIONAL APPROACH	6	4	10
TOTAL LEAVING BY GENDER	17	14	31

This resulted in a total of 184 children in six different schools forming the total population.

APPENDIX 8: TABLE OF ABSENCES DURING THE STUDY

On each occasion of data gathering, several visits were made to each school. The following table shows the number of absences on each occasion during the study by approach, gender and cohort.

TABLE A8: NUMBER OF ABSENCES BY GENDER, COHORT, TYPE OF INSTRUCTION AND OCCASION

APPROACH		OCCASION								
		1	2	3	4	5	6	7	8	9
Girls Cohort 1 (n=46)	T	0	0	0	0	1	3	0	0	0
	E	0	2	2	0	4	0	0	1	1
	D	0	0	0	1	0	0	2	2	1
Boys Cohort 1 (n=44)	T	0	1	1	0	0	1	2	1	0
	E	1	2	0	1	1	1	0	0	0
	D	1	1	1	2	3	1	4	2	4
Girls Cohort 2 (n=48)	T	-	0	2	0	0	0	0	0	0
	E	-	2	1	0	4	0	6	0	0
	D	-	2	0	0	0	2	5	1	2
Boys Cohort 2 (n= 46)	T	-	0	0	1	1	3	1	1	2
	E	-	1	2	0	3	1	2	1	1
	D	-	2	0	0	0	2	1	0	1
Total (n=184)	TOTAL	2	13	9	5	17	14	23	9	12

APPENDIX 9:   CLOZE PASSAGE

This is a story about Sam and Jane.

Last summer Sam and Jane __went__ on __holiday__ with their mum and dad. They sailed on a boat to an __island__ called Jersey where their mum's __friend__ lived.

Lots of other __people__ were on the ferry. It __was__ a long tiring __journey__ so when they arrived they went straight to bed.

The next morning they looked through the __window__ and saw a __garden__ full of lovely __flowers__, and a tree that they could climb. They knew they were __going__ to have a good time!

After breakfast they went to the beach. Sam and Jane wanted to __build__ a __castle__ out of __sand__ so mum and dad __sat__ on the beach and watched them. Sam and Jane __played__ for a long time then dad __said__

" __What__ do you want for your dinner today?"

" __Fish__ and chips " shouted the children.

"That __does__ sound like a good idea " agreed mum.

APPENDIX 10: CORRELATIONS FOR DVS 2-5

TABLE 10.1 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 2 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.976**	0.912**	0.931**
DV 3		0.817**	0.871**
DV 4			0.975**

**p<0.01

TABLE 10.2 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 3 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.948**	0.976**	0.963**
DV 3		0.871**	0.949**
DV 4			0.952**

**p<0.01

TABLE 10.3 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 4 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.960**	0.919**	0.884**
DV 3		0.814**	0.834**
DV 4			0.960**

**p<0.01

TABLE 10.4 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 5 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.945**	0.954**	0.851**
DV 3		0.873**	0.843**
DV 4			0.938**

**p<0.01

TABLE 10.5 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 6 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.978**	0.958**	0.919**
DV 3		0.917**	0.906**
DV 4			0.978**

**p<0.01

TABLE 10.6 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 7 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.921**	0.943**	0.815**
DV 3		0.839**	0.791**
DV 4			0.930**

**p=<0.01

TABLE 10.7 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 8 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	0.968**	0.956**	0.821**
DV 3		0.916**	0.831**
DV 4			0.937**

$**p=<0.01$

TABLE 10.8 INTER- CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 9 FOR WHOLE SAMPLE (N=114)

	DV 3	DV 4	DV 5
DV 2	.949**	.971**	.863**
DV 3		.901**	.859**
DV 4			.938**

$**p<0.01$

TABLE 10.9 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 2 BY COHORT

		DV 3	DV 4	DV 5
Coh 1 n=54	DV 2	0.955**	0.926**	0.941**
	DV 3		0.831**	0.882**
	DV 4			0.975**
Coh 2 n=600)	DV 2	981**	858**	844**
	DV 3		814**	847**
	DV 4			954**

$**p<0.01$

TABLE 10.10 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 3 BY COHORT

		DV 3	DV 4	DV 5
Coh 1 n=54	DV 2	0.949**	0.979**	0.962**
	DV 3		0.978**	0.944**
	DV 4			0.956**
Coh 2 n=60	DV 2	0.990**	0.962**	0.975**
	DV 3		0.928**	0.957**
	DV 4			0.992**

$**p<0.01$

TABLE 10.11 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 4 BY COHORT

		DV 3	DV 4	DV 5
Coh 1 n=54	DV 2	0.963**	0.928**	0.879**
	DV 3		0.840**	0.844**
	DV 4			0.962**
Coh 2 n=60	DV 2	0.981**	0.914**	0.865**
	DV 3		0.844**	0.836**
	DV 4			0.944**

**p<0.01

TABLE 10.12 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 5 BY COHORT

		DV 3	DV 4	DV 5
C 1 n=54	DV 2	0.955**	0.968**	0.868**
	DV 3		0.920**	0.898**
	DV 4			0.838**
C 2 n=60	DV 2	0.923**	0.933**	0.828**
	DV 3		0.784**	0.748**
	DV 4			0.925**

**p<0.01

TABLE 10.13 INTER-CORRELATION MATRIX FOR DVS 2-5 ON OCCASION 6 BY COHORT

		DV 3	DV 4	DV 5
C 1 n=54	DV 2	0.973**	0.969**	0.931*
	DV 3		0.931**	0.930**
	DV 4			0.977**
C 2 n=60	DV 2	0.986**	0.947**	0.901**
	DV 3		0.919**	0.895**
	DV 4			0.976**

**p<0.01

TABLE 10.14 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 7 BY COHORT

		DV 3	DV 4	DV 5
C 1 n=54	DV 2	0.887**	0.917**	0.733**
	DV 3		0.807**	0.766**
	DV 4			0.909**
C 2 N=60	DV 2	0.943**	0.964**	0.897**
	DV 3		0.870**	0.847**
	DV 4			0.955**

**p<0.01

		DV 3	DV 4	DV 5
Coh 1 n=54	DV 2	0.960**	0.956**	0.837**
	DV 3		0.911**	0.852**
	DV 4			0.946**
Coh 2 n=60	DV 2	0.976**	0.960**	0.810**
	DV 3		0.921**	0.810**
	DV 4			0.925**

**p<0.01

TABLE 10.16 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 9 BY COHORT

		DV 3	DV 4	DV 5
C 1 n=54	DV 2	0.953**	0.968**	0.856**
	DV 3		0.905**	0.851**
	DV 4			0.942**
Coh 2 n=60	DV 2	0.946**	0.974**	0.866**
	DV 3		0.899**	0.870**
	DV 4			0.930**

**p<0.01

TABLE 10.17 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 2 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.978**	0.977**	0.890**
	DV 3		0.946**	0.888**
	DV 4			0.957**
FEM n=61	DV 2	0.991**	0.891**	0.850**
	DV 3		0.846**	0.817**
	DV 4			0.980**

**p<0.01

TABLE 10.18 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 3 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.954**	0.985**	0.984**
	DV 3		0.896**	0.969**
	DV 4			0.966**
FEM n=61	DV 2	0.983**	0.919**	0.896**
	DV 3		0.874**	0.884**
	DV 4			0.976**

**p<0.01

TABLE 10.19 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 4 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.948**	0.960**	0.972**
	DV 3		0.834**	0.904**
	DV 4			0.975**
FEM n=61	DV 2	0.972**	0.915**	0.806**
	DV 3		0.855**	0.795**
	DV 4			0.945**

**p<0.01

TABLE 10.20 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 5 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.956**	0.970**	0.870**
	DV 3		0.924**	0.900**
	DV 4			0.939**
FEM n=61	DV 2	0.931**	0.937**	0.848**
	DV 3		0.807**	0.779**
	DV 4			0.944**

**p<0.01

TABLE 10.21 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 6 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.986**	0.976**	0.958**
	DV 3		0.949**	0.947**
	DV 4			0.989**
FEM n=61	DV 2	0.967**	0.951**	0.886**
	DV 3		0.892**	0.873**
	DV 4			0.961**

**p<0.01

TABLE 10.22 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 7 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.941**	0.963**	0.857**
	DV 3		0.887**	0.851**
	DV 4			0.937**
FEM n=61	DV 2	0.887**	0.915**	0.756**
	DV 3		0.769**	0.711**
	DV 4			0.921**

**p<0.01

TABLE 10.23 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 8 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.974**	0.980**	0.912**
	DV 3		0.954**	0.931**
	DV 4			0.964**
FEM n=61	DV 2	0.959**	0.922**	0.666**
	DV 3		0.860**	0.665**
	DV 4			0.681**

**p<0.01

TABLE 10.24 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 9 BY SEX

		DV 3	DV 4	DV 5
MALE n=53	DV 2	0.978**	0.977**	0.890**
	DV 3		0.946**	0.888**
	DV 4			0.957**
FEM n=61	DV 2	0.892**	0.962**	0.815**
	DV 3		0.823**	0.811**
	DV 4			0.908**

**p<0.01

TABLE 10.25 INTER-CORRELATIONS FOR DVS 2-5 ON OCC 2 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.982**	0.966**	0.970**
	DV 3		0.909**	0.936**
	DV 4			0.986**
ECEC n=36	DV 2	0.992**	0.903**	0.881**
	DV 3		0.877**	0.869**
	DV 4			0.980**
D'AL n=32	DV 2	0.994**	0.954**	0.926**
	DV 3		0.926**	0.923**
	DV 4			0.948**

**p<0.01

TABLE 10.26 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 3 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.976**	0.993**	0.976**
	DV 3		0.954**	0.978**
	DV 4			0.977**
ECL n=36	DV 2	0.991**	0.923**	0.930**
	DV 3		0.879**	0.904**
	DV 4			0.984**
D'TAL n=32	DV 2	0.994**	0.985**	0.987**
	DV 3		0.974**	0.993**
	DV 4			0.983**

**p<0.01

TABLE 10.27 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 4 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.950**	0.967**	0.952**
	DV 3		0.853**	0.892**
	DV 4			0.970**
ECLE n=36	DV 2	0.981**	0.979**	0.882**
	DV 3		0.962**	0.917**
	DV 4			0.938**
D'TAL n=32	DV 2	0.980**	0.896**	0.850**
	DV 3		0.830**	0.843**
	DV 4			0.938**

**p<0.01

TABLE 10.28 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 5 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.939**	0.937**	0.809**
	DV 3		0.866**	0.813**
	DV 4			0.938**
ECLE n=36	DV 2	0.914**	0.940**	0.817**
	DV 3		0.820**	0.821**
	DV 4			0.914**
D'TAL n=32	DV 2	0.962**	0.973**	0.937**
	DV 3		0.900**	0.903**
	DV 4			0.973**

**p<0.01

TABLE 10.29 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 6 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.967**	0.957**	0.907**
	DV 3		0.923**	0.914**
	DV 4			0.975**
ECLE n=36	DV 2	0.973**	0.970**	0.939**
	DV 3		0.927**	0.929**
	DV 4			0.980**
D'L n=32	DV 2	0.986**	0.959**	0.940**
	DV 3		0.919**	0.917**
	DV 4			0.988**

**p<0.01

TABLE 10.30 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 7 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.915**	0.969**	0.843**
	DV 3		0.868**	0.838**
	DV 4			0.926**
ECLEC n=36	DV 2	0.917**	0.961**	0.835**
	DV 3		0.838**	0.774**
	DV 4			0.925**
D'L n=32	DV 2	0.923**	0.923**	0.807**
	DV 3		0.821**	0.782**
	DV 4			0.946**

**p<0.01

TABLE 10.31 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 8 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2	0.976**	0.979**	0.894**
	DV 3		0.954**	0.917**
	DV 4			0.954**
ECLEC n=36	DV 2	0.958**	0.948**	0.806**
	DV 3		0.871**	0.770**
	DV 4			0.935**
D'TAL n=32	DV 2	0.964**	0.934**	0.739**
	DV 3		0.884**	0.733**
	DV 4			0.918**

**p<0.01

TABLE 10.32 INTER-CORRELATIONS FOR DVS 2-5 ON OCCASION 9 BY APPROACH

		DV 3	DV 4	DV 5
TRAD n=46	DV 2 DV 3 DV 4	0.954**	0.963** 0.892**	0.824** 0.809** 0.927**
ECLEC n=36	DV 2 DV 3 DV 4	0.923**	0.972** 0.880**	0.858** 0.870** 0.931**
D'TAL n=32	DV 2 DV 3 DV 4	0.957**	0.983** 0.924**	0.919** 0.920** 0.958**
				**p<0.01

APPENDIX 11: MESSAGES GIVEN ON OCCASION 2 FOR NON-CHILDES SAMPLES

These samples were gathered on Occasion 2 in all six schools. They exclude all conventional writing samples as once the given message related to conventional graphemes, work could be coded in CHILDES.

The children's comments or messages are presented in five lists, according to the type of 'text' they accompanied. These are

picture only
pre-graphemic symbols only
picture plus pre-graphemic symbols
picture plus graphemic symbols
graphemic symbols only.

Within each category, the comments or messages are listed in the same order, which is as follows:

child remained silent/ provided no message
child stated what it is (eg 'a picture')
child stated 'I can't write' or 'I don't know'
child stated 'it's just letters/writing'
child stated 'I can't remember'
child offered a label (eg 'the birds')
child offered a sentence
child offered a paragraph

The letter at the start of the line indicates which stated method of teaching the school adopted. Where the child gave a verbal response, this was noted and is presented here. Further details are provided in brackets.

PICTURE ONLY

♦ child remained silent/ provided no message
E   (no message)
T   (unwilling to write wanted to copy)
♦ child offered a label (e.g. 'a picture')
E   "a picture"
E   "a picture"
E   "just a picture"
T   "the two birds"
D   "reindeer and egg"
♦ child stated 'I can't write'
T   "can't write"
T   "I can't write"
T   "I can't - I don't know how to" (drew picture but said he couldn't write)
♦ sentence offered
E   "they are building a nest"
E   "a baby bird has growing"

PRE-GRAPHEMIC SYMBOLS

♦ child remained silent/ provided no message

294

D   (no message)
D   (no message)
D   (shook head - no message)
D   (no message)
T   (no message. Another child pointed out what looks like a number 2 -
          this was hotly denied!)
◆   child stated `I can't write' or `I can't remember'
T   "I don't know how to write - I'm left-handed you know"
T   "can't remember"
◆   sentence offered
T   "the birds were making a nest"
D   "here are two birds. Look"
◆   paragraph offered
E   "Mrs bird flied out the nest Mummy bird was feeding the chicks and the chicks eat
          worms what Mrs bird feeded the chicks but Mrs bird did still feed them but daddy
          one was feeding it that time but he was still feeding him"
          (wrote and read right to left, tried to copy from another child. no one-to-one)
D   "The birds make a nest and they put some eggs in it"
          (No directionality or one-to-one when reading or writing. When offering his
          message he pointed randomly at the marks on the page, starting at the bottom)

PICTURE PLUS PRE-GRAPHEMIC
◆   child remained silent/ provided no message
T   (no message)
E   (long silence then shook her head)
◆   child stated `I can't write' or `I can't remember'
T   "I don't know how to write the words. One mummy bird, one daddy bird, three baby
          bird"   (about the drawings)
E   "I don't know"
E   "I don't know - I've forgotten now"
◆   label offered
T   "it's about the birds"
D   "two birds" (reluctant to give message)
◆   sentence offered
D   "This is a reindeer"
E   "the mummy bird flying away"
◆   paragraph offered
E   "Once upon a time there was two birdies and they flied on a reindeer and then they
          began to hatch and then they began to hatch more until it was time to get some
          food for the babies" (no reference to "writing" on page- just told the story)
D   "once upon a time flew a little bird He landed on a tree he builded a nest what was
          it said the bird it is a nest oh said the bird. The bird said what do you do in [doing]?
          I am doing my work Oh bird what did you say? I said something. What you didn't
          noticed. The bird said where are we? We are at our tree nest."
          (no one-to-one correspondence)

PICTURE + GRAPHEMIC
◆   child remained silent/ provided no message
E   (no message - sounded out letters phonetically)
E   (no message but said "I've written my long name" and all letters across top of
          paper were from her name)
E   (no message - shook her head but then picked out the word "LOOK")
◆   child stated `I can't write' or `I can't remember'
D   "I don't know"
D   "I don't know it"
◆   label offered
D   "Baby and the reindeer and the chicky babies"

◆ sentence offered

T   "once upon there was two birds" (no one-to-one)

D   "Once upon a time"

D   "The birds made a nest"

D   "They maked a nest"

D   "one day the bird was making a nest"   (no one-to-one)

D   "the eggs were hatching"
      (pointed at a circle on the page and said "there's the nest")

D   "Rudolph had a nest what the birds put on Rudolph's ear" (no one-to-one)

D   "a bird was on a reindeer and the reindeer was eating"
      (pointed randomly at symbols, no one-to-one)

◆ paragraph offered

D   "one day there was two birds making a nest for the three birds one day mummy bird sat on the eggs and keeped them warm. One day the eggs cracked and three baby birds came out."   (no one-to-one)

D   "one sunny day the birds were building a nest"   (no one-to-one)

D   [picture of sun] "one sunny day the birds were planting a nest they got straw and they builded it" [picture of nest]
      (read story then said "I'll do me dot" and added a full stop)

D   "Once upon sa [verified] time the birds hear the eggs cracking so they moved out the way till it cracked but" (read line for line but without one-to-one correspondence then said "I haven't got any more writing" and stopped)

GRAPHEMIC

◆ child remained silent/ provided no message

E   (shook his head)

T   (shook head)

E   (no message -, reluctant to write, blushed,shook her head when asked)

◆ child stated `I can't write' or `I can't remember'

T   "don't know" (reluctant to write - wanted to copy from his friend)

E   "don't know"

E   "don't know"

T   "I don't know"

T   "don't know"

E   "I don't remember"

E   "Forgot"

T   "I forgotten what it says now"

E   "I copied Tom"

E   "don't know what it say" (then picked out the word "LOOK" in the middle)

T   "just letters"

T   "just writing"

T   "just writing"

T   "I'm not sure what it says, I can't read all that"

E   "what does mine say?" (was embarrassed)

E   "can't read it"

E   "can't read it"

T   (no message, tried to pronounce sounds phonetically)

T   (no message, tried to pronounce sounds phonetically)

◆ label offered

T   "a bird" (then asked [with reference to letter a] is this a b? How do you do a b? How do you do a a?)

E   "a bird"

T   "birds"

E   "a nest" (no one-to-one)

T   "eggs bed" (no one-to-one)

T   "is a mummy bird and she going to put some eggs and `em crack"   (wrote bottom to top, left to right. Didn't "read" with any obvious directionality)

T   "this is when they birds flied away" (no reference to text)

T   "the birds had to build a nest" (no one-to-one)
T   "the birds builded a nest" (no one-to-one)
T   "the mummy said in laid some eggs" (wrote and read left to right, no one-to-one)
T   "the bird was times was being alone" (no one-to-one, re-read differently)
T   "the three little chicks cracked out of the eggs" (no one-to-one)
T   "some baby chicks and when they had baby they went"
        (no directionality or one-to-one)
T   "I looked up at a reindeer and I saw some birds"
        (line awareness, one-to one correspondence between word and printed unit)
T   "the two birds built a nest and laid eggs" (no one-to-one)
T   "a bird was laying out a nest and some baby chicken hatched"
        (`read' this in reading book staccato fashion)
T   "the bird made a nest on the reindeer's antlers" (no one-to-one. read this to me
        then added full stops at the end of each line saying "I've put full stops")
E   "Once upon a time there was some eggs laid"
        (didn't look at writing while reading, no one-to-one)
E   "the reindeer than the birds hatched" (didn't look at writing, no one-to-one)
E   "once upon a time a bird chosen to make a nest" (no one-to-one)
E   "birds can fly" (no one to one)
E   "we have some birds" (no one-to-one, wanted his name card to copy)
E   "one bird is wide awake" (no one-to-one)
D   "I like my mum and dad" (reluctant to write and reluctant to offer message)
D   "The birds made a nest"
D   "one day the birds landed on a tree the birds landed on a reindeer"
        (no one-to-one)
D   "there was a bird in a bug good he said he eats bugs - see"
        (wanted to fill the page, no one-to-one)
D   "I went to play outside my mum's going shop and get me some yoghurt"
        (no one-to-one)
D   "I went to get some grass and some sticks and made a nest"
        (pointed, giving one word for each symbol)
D   "When the birds made a nest the eggs hatched"
        (wrote right to left and read right to left, but no one -to-one.)
D   "Once upon a time there was two birds in a bird nest" (no one-to-one)
D   "birds flied away off the tree they went to the babies"
        (no one-to-one, read in a stilted `reading book' style -oversyllabification and stress)

T   "two birds were making a nest and they found two more birds and the eggs
        hatched" (no matching of story to print, or use of the lines of print she'd written)
T   "I am building a nest said mummy bird so they builded a nest and some eggs came
        laid and some blue speckles on and they were hungry and they eated worms"
        (no one-to-one)
T   "one day the birds came out and they landed on a tree and they made a nest and
        the mum and dad but the mum had the babies So they hatchid them and give
        them worms then they flew away again to find some more worms"
        (no one-to-one)
T   first time said "once upon a time" then later "one day a bird was making a nest on a
        tree the birds laid an nest the birds"
        (no one-to-one, `read' this in reading book staccato fashion. At first it seemed
        there might be correspondence as first words look like once upon a time)
T   "once upon a time two birds they made a nest and the mummy bird laid some eggs
        then the eggs hatched" (no one-to-one)
T   "they came through town and they go in town to buy some orange and some piece
        of cheese they have some milk and some blackcurrant"

(awareness of lines but no one-to-one)

E   "once upon a time there was a mother and a daddy and they have some little birds but they made a nest"
(gave one word for each letter and seemed at one point to be using phonics (some little birds + slb) but this didn't last and it wasn't re-read the same way)

E   "In the middle mother bird flew down and then daddy bird flew down and they went and builded the nest (ran out of writing here so did some more) and mother bird sat in the nest and the spotted eggs and out the eggs popped 3 little chicks"
(started writing at bottom of page. Poor directionality - started top centre then added randomly)

E   "the birds are flying and they are making it very clever and they try very hard and they can fly with their mums and dads" (no one to one)

D   "one morning the birds were making a nest and they was trying very hard not to let the rain come down and then he was still there next morning and he did loads of tricks and not try to and let the rain come through"
(at first she said "I can't write" then settled down. Marks go across the top of the page then bunch in the top left corner. As she "read" she pointed across the top, then to marks in top left corner)

D   "one day when the sun was shining a bird landed on a tree and it maked a nest another bird came then it was a family. The mother sat down in its nest it laid some eggs it was all spotty and they hatchid. They were little yellow chicks."
(no one-to-one)

D   "one sunny day a bird flew on a tree then another bird then mummy bird made a nest, sat on the nest and laid some eggs and the baby birds were hungry"
(then said "I better finish this off" and did more writing. The second reading was different)

D   "once upon a time there was some birds and a mummy had some eggs and the mummy cracked them and some birds came out" (no one-to-one as she read the story, but she did point at birds (bsrehs) and said "that says birds")

D   "one day there was chickens and the eggs they wasn't on tree they were on a reindeer's head" (started trying to represent sounds one-wu day bu=day bs=birds but didn't re-read it as this. Also on re-reading he added lines between the words. Couldn't seem to keep the story in his head).

D   "Once upon a time/ there was a birds /and a mummy and a daddy bird /and they laid some eggs and /some baby chicken birds came out/ of the eggs and when they were/ big they flied /away" Pointed at marks as she read the message, though no one-to-one. After `flied' she had run out of symbols so added another line of marks).

APPENDIX 12: COMPARING THE SPELLINGS OF BOYS AND GIRLS
TABLE A12.1: TOP FIFTY CORRECTLY SPELT WORDS ON OCC 9 BY ALL BOYS AND GIRLS IN STUDY

Occ 9 - top 50 correct words by girls		Occ 9 - top 50 correct words by boys		
1505	the	1083	the	
1088	and	830	and	
661	he	404	he	
485	pig	315	pig	
422	to	289	a	
416	a	272	house	
406	house	263	to	
306	little	218	of	
304	of	197	in	
284	in	192	pigs	
282	pigs	178	so	
281	so	148	down	
242	said	138	they	
219	wolf	136	said	
190	down	135	wolf	
189	they	132	little	
174	his	131	his	(top17 words match)
161	then	128	was	
150	you	105	i	
147	was	105	one	
147	went	96	then	
145	i	93	went	
144	one	92	it	
141	let	87	on	
135	some	85	big	
125	came	82	let	
119	ran	77	but	
116	me	74	ran	
112	day	72	you	
107	chin	70	me	
107	not	70	out	
105	big	66	not	
101	but	65	chin	
92	blow	64	blow	
92	three	64	came	
91	will	61	made*	
83	it	58	my	
81	on	57	day	
81	your	57	with	
72	my	56	three	
71	man*	55	will	
68	out	54	no	
67	did*	54	some	
67	no	45	your	
67	there	44	bad*	
66	with	42	first	
59	by*	40	sticks*	
57	mother*	40	that*	(* = different)
56	first	39	had	
56	had	39	there	

(Top 17 words are the same, 46/50 words match)

TABLE A12.2: TOP FIFTY CORRECTLY SPELT WORDS ON OCC 9 BY BOYS AND GIRLS IN TRADITIONAL SCHOOLS

Occ 9 boys (n=35)		Occ 9 girls (n=28)		
565	the	543	the	
464	and	380	and	
193	he	250	he	
156	pig	176	pig	
149	house	176	house	(top 5 match)
144	a	165	little	
139	to	160	to	
120	of	155	a	
98	in	116	of	
92	so	102	so	
76	they	101	in	
74	was	99	pigs	
74	wolf	87	wolf	
73	said	85	said	
72	pigs	77	down	
70	down	67	his	
70	his	63	then	
55	big	56	you	
53	little	53	let	
53	on	53	some*	(*= different words)
50	i	52	went	
49	it*	51	i	
49	then	49	came	
49	went	47	they	
41	one	46	one	
40	but	45	ran	
40	came	44	chin	
37	not	44	day*	
36	ran	41	me	
35	bad*	38	three*	
34	let	37	not	
34	out*	37	was	
34	with	34	with	
30	made*	33	big	
30	me	32	but	
29	blow	31	blow	
28	chin	30	man*	
28	you	30	on	
26	door*	28	found*	
25	no*	28	lived*	

(Top 5 words are the same, 44/50 words match)

TABLE A12.3: TOP FIFTY CORRECTLY SPELT WORDS ON OCC 9 BY BOYS AND GIRLS IN ECLECTIC SCHOOLS

Occ 9 boys (n=25)		Occ 9 girls (n=37)		
243	the	596	the	
161	and	405	and	
96	he	251	he	
82	pig	182	pig	
74	a	171	to	
66	house	162	a	
56	to	155	house	(top 7 match)
54	of	128	pigs	
49	little	114	said	
49	pigs	110	in	
48	in	107	of	
40	so	104	so	
36	down	101	little	
35	one	100	they	
30	said	88	wolf	
30	then	75	down	
28	they	66	went	
27	let	64	then	
25	wolf	63	i	
24	i	63	you	
23	his	61	his	
22	made*	59	let	
22	me	59	was	
22	went	52	came*	(*=different words)
21	chin	52	one	
21	no	52	some	
20	day	51	me	
20	my*	51	will	
20	you	49	ran	
19	three	43	but	
18	big	43	three	
18	ran	41	your*	
18	some	40	big	
17	but	40	blow	
17	out*	40	it	
16	it	39	day	
16	on	38	not*	
16	was	37	on	
15	blow	31	chin	
15	will	31	no	

(Top 7 words are the same. 47/50 words match).

TABLE A12.4: TOP FIFTY CORRECTLY SPELT WORDS ON OCC 9 BY BOYS AND GIRLS IN DEVELOPMENTAL SCHOOLS

Occ 9 boys (n=22)		Occ 9 girls (n=26)	
275	the	366	the
205	and	303	and
115	he	160	he
77	pig	127	pig
71	a	99	a
71	pigs	91	to
68	to	81	of
57	house	75	house
51	in	75	so
46	so	73	in
44	of	55	pigs (top 11 match)
42	down	51	was
38	his	46	his
38	was	46	one
36	wolf	44	wolf
34	they	43	said
33	said	42	they
31	i	40	little
30	little	38	down
29	one	34	then
27	it	32	big* (*= different words)
24	you	32	chin
22	went	32	not
21	let	31	i
20	blow	31	you
20	but	30	some*
20	ran	29	day*
19	out	29	let
19	will*	29	went
18	had*	28	my
18	me	26	but
18	on*	25	ran
17	then	24	came*
16	blew*	24	me
16	chin	21	blow
16	first*	21	it
15	man*	20	by*
15	my	19	out
15	not	17	your *
15	that*	16	did*

(Top 11 words are the same, 43/50 words match)

APPENDIX 13: MESSAGES PROVIDED BY FOUR CHILDREN ON ALL OCCASIONS

The following examples show how a sample of children responded when asked about their writing. Comments in brackets indicate give further detail of the children's behaviour. Not all of the messages will have been accurately represented by conventional spellings, but this section is just interested in the message quality of work.

A total of four samples are provided to show a range of responses. These are discussed in Chapter 7.

CHILD 1: MALE, COHORT 2, ECLECTIC APPROACH

OCC.2   (child "read" the writing as follows, though there was no one-to-one correspondence: "Mrs Bird fixed the nest. Mummy bird was feeding the chicks and the chicks and worms what Mrs bird feeded the chicks but Mrs bird did still feed them but daddy one was feeding it that time but he was still feeding him")

OCC.3   (child "read" the writing as follows, though there was no one-to-one correspondence): "Alex's bedroom messy"

OCC.4   (child copied "one day" from the wall, so don't judge on these words. No message offered)

OCC.5   the squirrel was red and he ran up the trunk and a cat climbed up the trunk and a monkey climbed the trunk the elephant had different colours then the cat up the elephant then the monkey then put his trunk down then they all slide

OCC.6   Katie's mum woke Katie up because her grannies were coming on holiday and she took her sheep with her to the show

OCC.7   the bears lived in a cottage and the so they went for a walk and then a little girl was coming and went in the house and Goldilocks tried dad's porridge and then they all came back home and when they saw her they growled at her and then she ran away from away from the bears and she never came back the end of the story

OCC.8   Sam and the pan
one day he was in bed and got up and went downstairs to get his breakfast and stood on the chair and the pan fell on his head and one pan did not come off so he went to the doctor's but the doctor could not get off and some people pulled and it came off and went home and he did it again the end

OCC.9   one day there were the three little pigs and they lived with their mother in a very small house and their mother said you will have to live in your own little house so the first little pig went get some straw and when he got the straw he started to build his house and along came the big bad wolf and knocked on the first little pig door and the big bad wolf said little pig let me in but the little pig said no I am not going to let you in the big bad wolf said if you dont let me in I will huff and a puff and I will blow your house down and then the second little pig went to get some bricks and then he climbed down the chimney and he burned his bum the end

CHILD 2: FEMALE, COHORT 1, DEVELOPMENTAL APPROACH

OCC.1   my sister was playing with me and my sister was cleaning up

OCC.2   They maked a nest

OCC.3   (child could offer no message for the text)

OCC.4   (child could offer no message for the text)

OCC.5   once there was a elephant

OCC.6   Katie Morag's mum woke Katie Morag up Katie Morag
nan is coming granny is coming today

OCC.7   once upon a time there were three little bears they woke up and were very hungry so they went down and they did it was hot so they went out and a little girl came through the woods and she saw a house she went in and saw a bowl and tried it it was too hot she tried it was too soft so she tried baby bear's porridge it was just right then she tried daddy bear's chair it was too hard so she tried mummy's chair it was too soft so she tried baby bear's chair it was just right then it broke she went upstairs she tried daddy bear's bed it was too hard

so she tried mummy's bed it was too soft so she tried baby bear's bed it was just right she went to sleep the bears came back daddy bear said who's been eating my porridge mummy bear's porridge mummy said who's been eating my porridge so they went upstairs daddy bear said who's been in my bed said daddy bear mummy bear said who's been sleeping in my bed she woke up and saw the bears she ran outside

OCC.8 Sam woke up with a smile on his face and jumped out of bed and ran downstairs and swang on the banister and went in the kitchen and Sam kneeled on the stool and got his head stuck in the pan and he ran to his mother and they pulled the pan mum had an idea they went to the doctor and they went to the doctor put red stuff on his head and ran down the steps and got his head stuck in the bar and everyone pulled and his head came out and thanked each other and Sam did it again and didn't go to the doctor

OCC.9 once upon a time there was a pig who had three pigs she said you are getting too big to live in this house so they packed their things one of them saw some straw and started to build his house then the other pig saw some sticks and he started to build his house the other pig saw some bricks and started to build his too so he started to build his house then the big bad wolf came and wolf went to the first pig's house and said let me in no I won't he said so he puffed and puffed and he puffed but he couldn't blow the house down instead he climbed down the chimney the pigs chimney the pigs put a big pot under the chimney the wolf fell in the pot and ran to the pond and put his bottom in the pond and he was never seen again and that was the end

CHILD 3: MALE, COHORT 2, DEVELOPMENTAL APPROACH

OCC.2 the birds made a nest

OCC.3 (child could offer no message for the text)

OCC.4 Red Riding Hood

OCC.5 the cat and the squirrel and the monkey went up the trunk but it was a elephant they slid down

OCC.6 the sheep went in the mud he had a bath and puts him on show

OCC.7 one day mum bear made some porridge it was too hot so they went out and a little girl went in cottage and saw the porridge she tasted the big bowl it was lumpy she tried mum's porridge it was soft she tried baby bear's porridge it was just right she ate it all up she tried the chairs dad bear's chair it was too hard mum bear's chair it was too soft she tried baby bear's chair it broke she went upstairs she tried dad bear's bed it was too hard she tried mum bear's bed it was too soft she tried baby bear's chair it was just right the 3 bears came home who's been eating my porridge who's been eating my porridge who's been eating my porridge and it has all gone they went in the living room who's been in my chair said dad bear who's been in my chair said mum baby bear said who's been sitting in my chair and it is broken they went upstairs who's been in my bed who's been in my bed who's been in my and she's still here she ran back downstairs and ran back home

OCC.8 one day Sam got up with a big smile on his mouth he got up and got dressed and ran down the stairs and got on the stool and tried to look what was for breakfast he kneeled to fall back and he fell on the table and everything up in the air and the pan on his head he shouted mum his mum came downstairs she saw him with the pan on his head his mum tried to pull it off but Sam's mum couldn't pull it off Sam was hungry his mum had to bend it right back and fed Sam his breakfast then his mum took him to the doctor's the doctor hit him on his head with a hammer but it didn't work he put some oil on his eyes Sam ran out banged his head and the pan went in the railings some people pulled the pan came out and so did Sam's head and they went home and the pan was banged when they got home the same thing happened again

OCC.9 one day there were three little pigs and they were walking down the lane the first little pig made his of straw the second little pig made his of sticks and the third little pig made his of bricks but the wolf he blew the first house down he ran to the second house and the wolf blew it down the two pigs went to the brick house he could not blow it down so he went up the chimney and slipped

304

and fell in to the pot and jumped in cold water and the pigs lived happily ever after the end

CHILD 4: MALE, COHORT 1, DEVELOPMENTAL APPROACH

OCC.1   (child said "my name" then described the picture)

OCC.2   this is a reindeer

OCC.3   Alex D***** is messy mum tidied up

OCC.4   I can go to granny's house and little red hood and a wolf came to riding hood and the fox did nothing

OCC.6   Katie and the two grandfathers and the sheep got stuck in swamp the sheep went to the bath and used grandfather's stuff the sheep won because the party got on

OCC.8   Sam woke up and jumped out of bed and slid down the stairs he went in the kitchen and sat on the stool and he caught his head in the frypan and mum shouted what have you done mum put on her coat and went the doctor's and the doctor's and he said I have a plan I will get my hammer but it wouldn't get off then they pulled the pan it came off

OCC.9   the three pigs the mother pig said to the three pigs you have to make your own house you are too big for this house said mother pig they made their own house there was straw sticks and bricks the best house was the brick house all the pigs were alright

A14.1 Spelling of was by boys in traditional approach schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9	Test C
m1			wfa				was	was	was	was	was
m2	was	wos	was	was	was	was	was	was	was		was
m3		was	wos	was	was	was	was	was	was	was	was
m4					was	was	wos	was	was	was	was
m5					wos/wons	wos	was	was	was		was
m6			w		was	was	was	was	was	was	was
m7		woz	woz	wos	wos	wos	wos	was	was	was	was
m8	w	wos	wos	wos	was		was	was	was	was	was
m9					wos		wos	went			was
m10							wos	was			was
m11				went		was	was	was		was	was
m12			wo		was	was/u	was	was	was	was	was
m13							was	was	was	was	was
m14					was		was			was	was
m15						wos	wos	wos	wos		was
m16			was	was	was	was	was	was	was	was	was
m17				wes/rde	was		was	was			was
m18					was		was	was	was/wos	wors	was
m19						was	was	was	was	was	was
m20					wos		wos	wos			was
m21						was	was	was		was	was
m22						was	was	was	was		was
m23						was					was
m24										wos/was	wos

A14.2 Spelling of was by girls in traditional approach schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9	Test C
f1		was	was		was		was	was			was
f2		wosa	wof	wos	was		was	was	was	was	was
f3					was	was	was	was	was	was	was
f4		ios			wos	was	was	was	was	was	was
f5			w	weti	was		was	was		was	was
f6					wrr/wen		wes	was	was	was	was
f7			w		whe		wos	was	was	was	was
f8						wie	was	was	was	was	was
f9						wos	wni	was			was
f10							wes	was	was	was	was
f11							w	was	was		was
f12				weiha	wen	was	wse	was	was		was
f13	was		was	was	was	was	was	was	was	was	was
f14		wos		was	was	was	was	was	was		was
f15		wos	wos		was		was	was	was	was	was
f16		wos	was	was	was	was	was	was	was	was	was
f17					was	was	was	was			was
f18					was		was	was	was		was
f19			w	was	was	was	was	was	was	was	was
f20			w	was	was	was	was	was	was	was	was
f21				was	was	was	was	was	was		was
f22	won				was	was		was	was	was	was

Page 307

A14.3 Spelling of was by males in eclectic approach schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9	Test C
m1	w		wv		woz		wos			was	was
m2		woz	woz	wos		was	was	was		was	was
m3			woz		wes	was	was	was		was	was
m4			wos		was	was	was	was		was	was
m5						was	wos	was	was		was
m6					was	wos	was		wos/was		wos
m7		wos	wos	wov/wos	was	was	was	was	was	was	wass
m8					was	wos	wos	was	was		was
m9		was	was		was		was	was			was
m10			was		was		was	was		was	was
m11			wes	w/wos	was	was	was	was	was		was
m12		wi	wos		was	was	wosg	wos			wus
m13			ws		was	wus	wus				was
m14			w	we	was	was	was	was/wus	was	was/wus	was
m15					wos	was	was	was/what			was

A14.4 Spelling of was by girls in eclectic approach schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9	Test C
f1		yos	woe		was	was	was	was	was	was	was
f2	we		ws		was	was	was	was	was	was	was
f3			woz	wos	wos	was	was	was	was	was	was
f4			wanl	was	was	was	was	was	was	was	was
f5			was	waz	was	was	was	was	was	was	was
f6			woz	wos	wos/was	was	was	was	was	was	was
f7					was		was	was/wos	wos	was	wos
f8			waap		wos		wos	wsy	was/wos		was
f9				was	was		was	was			was
f10					wos			was/wos	was/wose	wos/wis/was	was
f11						wos	wos	was	was	was	was
f12							was	was	was	was	was
f13			w			wos	wos	was		was	was
f14			was	was	was	was	was	was	was	was	was
f15			wo	wos	was	was	was	was	was	was	was
f16			wos		was	was	was		was	was	was
f17			wetotot			wos/was	wos	was	was		was
f18			wos		was		wos	was			was
f19							was	was		was	was
f20					wos		was	was	was		was
f21								wos			wost

A14.5 Spelling of was by boys in developmental approach schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9
m1	wos	wos	wos		was	was	was	was	was	was
m2				wos			was			was
m3								wos		went
m4					was	was	was	was	was	was
m5					was		was	waz/was	was	
m6						was		wos/was		
m7	wos	wos	wos		wos	was/wos	was	was	was	was
m8			wos		was	was	was	was	was	was
m9	we		woz		wos	wo/wos		was	was	was
m10						was	was	was		was
m11			wos	woz		wos	wos	was		was
m12				wus	was	was	wos	was	was	was
m13					w	w/wo	woz	waz/wos/ wo	wos/was	was
m14						woz	woz	wos	wos/was	was

A14.6 Spelling of was by girls in developmental schools

	Occ 2	Occ 3	Test A	Occ 4	Occ 5	Occ 6	Test B	Occ 7	Occ 8	Occ 9	Test C
f1		yos	woe		was	was	was	was	was	was	was
f2			ws		was	was	was	was	was	was	was
f3			woz	wos	wos	was	was	was	was	was	was
f4	we		wanl	was	was	was	was	was	was	was	was
f5			was	waz	was	was	was	was	was	was	was
f6			woz	wos	wos/was	was	was	was	was	was	was
f7					was		was	was/wos	wos	was	was
f8			waap		wos		wos	wsy	was/wos	was	wos
f9				was	was		was	was			was
f10					wos	wos		was/wos	was/wose	wos/wis/was	was
f11			w		wos	wos	wos	was	was	was	was
f12							was	was	was	was	was
f13			was			wos	wos	was		was	was
f14			wo	was	was	was	was	was	was	was	was
f15			wos	wos	was	was	was	was	was	was	was
f16					was	was	was		was	was	was
f17			wetotot			wos/was	wos	was	was		was
f18			wos		was		wos	was			was
f19						was		was		was	was
f20					wos		was	was	was		was
f21							was	wos			wost

Page 311

APPENDIX 15: SPELLING TEST STATISTICS

TABLE A15.1: Spelling test: Correlations between regular and irregular words on each occasion for whole sample (n=114)

	Correlation	Significance
Occ A regular and Occ A irregular	.632	.000**
Occ B regular and Occ B irregular	.665	.000**
Occ C regular and Occ C irregular	.790	.000**

** p<0.01

TABLE A15.2: Spelling test: Correlations between regular and irregular words on each occasion by sex

		Correlation	Significance
Male (n=53)	Occ A regular and Occ A irregular	.537	.000**
	3Occ B regular and Occ B irregular	.622	.000**
	Occ C regular and Occ C irregular	.847	.000**
Females (n=61)	Occ A regular and Occ A irregular	.784	.000**
	Occ B regular and Occ B irregular	.708	.000**
	Occ C regular and Occ C irregular	.746	.000**

** p<0.01

TABLE A15.3: Spelling test: Correlations between regular and irregular words on each occasion by cohort

		Correlation	Significance
Coh 1 (n=54)	Occ A regular and Occ A irregular	.643	.000**
	Occ B regular and Occ B irregular	.707	.000**
	Occ C regular and Occ C irregular	.859	.000**
Coh 2 (n=60)	Occ A regular and Occ A irregular	.041	-
	Occ B regular and Occ B irregular	.588	.000**
	Occ C regular and Occ C irregular	.708	.000**

** p<0.01

TABLE A15.4: Spelling test: Correlations between regular and irregular words on each occasion by approach

		Correlation	Significance
Trad (n=46)	Occ A regular and Occ A irregular	.743	.000**
	Occ B regular and Occ B irregular	.665	.000**
	Occ C regular and Occ C irregular	.746	.000**
Eclectic (n=36)	Occ A regular and Occ A irregular	.796	.000**
	Occ B regular and Occ B irregular	.706	.000**
	Occ C regular and Occ C irregular	.764	.000**
D'ment (n=32)	Occ A regular and Occ A irregular	-	-
	Occ B regular and Occ B irregular	.600	.000**
	Occ C regular and Occ C irregular	.826	.000**

** $p < 0.01$

APPENDIX 16

TABLE 16.1: TOTAL NUMBER OF WORDS BY APPROACH

APPROACH		OCCASION							
		2	3	4	5	6	7	8	9
Trad.	Mean	5.30	7.13	26.46	42.57	49.61	156.63	150.00	202.26
(n=46)	S.D.	12.46	22.59	38.19	25.59	35.49	102.63	89.03	120.54
	Range	75	150	223	104	175	535	431	559
Eclectic	Mean	5.67	7.83	33.03	40.22	49.03	153.56	135.56	156.64
(n=36)	S.D.	8.80	10.29	40.21	19.94	31.83	84.98	60.29	85.01
	Range	34	35	218	85	143	317	311	324
D'mental	Mean	4.19	4.22	23.16	37.56	56.44	195.63	169.16	188.31
(n=32)	S.D.	8.90	7.99	26.52	36.38	54.62	113.27	86.27	117.35
	Range	29	27	100	182	215	525	432	516
Total	Mean	5.11	6.54	27.61	40.42	51.34	166.61	150.82	183.94
	S.D.	10.39	15.99	35.92	27.41	40.55	101.41	80.58	110.37

TABLE 16.2: TOTAL NUMBER OF WORDS BY SEX

SEX		OCCASION							
		2	3	4	5	6	7	8	9
Male	Mean	6.49	8.83	22.64	36.06	44.21	146.13	143.64	171.96
(n=53)	S. D.	13.07	21.88	35.16	29.34	42.60	113.09	92.12	130.88
	Range	75	150	223	182	215	535	431	598
Female	Mean	3.90	4.54	31.92	44.21	57.54	184.39	157.05	194.34
(n=61)	S.D.	7.20	7.62	36.29	25.24	37.94	87.13	69.22	88.67
	Range	29	29	218	96	151	483	432	399
Total	Mean	5.11	6.54	27.61	40.42	51.34	166.61	150.82	183.94
(n=114)	S.D.	10.39	15.99	35.92	27.41	40.55	101.41	80.58	110.38

TABLE 16.3: TOTAL NUMBER OF WORDS BY COHORT

COHORT		OCCASION							
		2	3	4	5	6	7	8	9
Cohort 1	Mean	8.67	11.20	38.22	46.13	60.07	178.44	167.32	207.35
(n=54)	S.D.	13.41	21.48	44.40	31.66	45.17	91.01	83.19	125.60
	Range	75	150	223	182	203	346	459	590
Cohort 2	Mean	1.90	2.33	18.05	35.28	43.48	155.95	135.97	162.87
2(n=60)	S.D.	4.79	6.11	22.45	21.95	34.40	109.60	75.81	90.59
	Range	22	34	100	85	215	536	411	525
Total	Mean	5.11	6.54	27.61	40.42	51.34	166.61	150.82	183.94
(n=114)	S. D.	10.39	15.99	35.92	27.41	40.55	101.41	80.58	110.37