Consistency of Spelling Error Patterns:

An Investigation Into the Consistency of Children's

Spelling Errors using Error Analysis

by

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Abstract

This research investigated the consistency of children's spelling errors across three grade levels, two to four, five and six, and seven and eight. Diagnoses of children's weaknesses in academic subjects are starting to incorporate error analysis as a means of identifying and remediating specific weaknesses. Research is necessary to see if certain error types are normally consistent for children over time, or with different grade and/or ability levels. This research consisted of dictated word lists, repeated five times over thirteen weeks. Errors were collected from these samples and classified according to an expanded Spache classification system covering twenty-one error types. A Multivariate Analysis of Variance (MANOVA) was conducted to assess the effects of time, grade level, sex and ability on individual error types. While grade level did show a significant effect, ability was by far a greater factor in the number of phonetic and non phonetic vowel and consonant substitutions. Results are discussed in light of models of children's acquisition of spelling that take developmental/maturational and/or information processing factors into account.

Introduction

Spelling, as the acquisition of rote-memorization of words or rules has come under increasing challenge over the years (Anderson, 1985; Marino, 1981; Zutell, 1980). Numerous authors now approach the study of spelling as reflective of complex cognitive information processing (Ehri, 1980; Goyen & Martin, 1977; Jorm, 1985; Morton, 1980; Swanson & Rathberger, 1986) or from a developmental perspective (Bookman, 1984; Gentry, 1984; Henderson & Beers 1980), emphasizing stage related maturation.

Concurrent with these shifts has been the adoption of analyzing spelling errors as a means of assessing breakdowns in the cognitive processes (Goyem & Martin, 1977; Jorm, 1985), or as indicators of developmental breakdowns or delays in spelling ability (Anderson, 1985; Gentry, 1984). Specifically, error analysis has been utilized in the separation and identification of normal and dyslexic children (Carpenter, 1983; Holmes and Pepper, 1977; Moats, 1983; Nelson, 1980), those who may be learning disabled (Boder & Jarrico, 1982; DeMaster, Crossland, & Hasselbring, 1986) and even in studying those types of errors made by children with behavioral and emotional problems (Glavin & DeGirolamo, 1970). However, what hasn't developed as succinctly is the empirical evidence that types of spelling errors for children are

consistent over time, and grades and sex. This research proposes to examine whether error types for children are consistent across grades and across ability levels within grades and over time. Furthermore it proposes to use error analysis as a means of collecting data rather than diagnostic tests in order to see how error analysis performs on a level other than idiographic. A number of studies have used error analysis on one or two children or groups with small n's. However, few studies have used larger samples in assessing those types of errors that may occur normally. Of the errors that do occur, a question arises as to their diagnostic benefit in assessing where the problem lies.

For this research into spelling errors as a viable area of investigation, a rationale is presented concerning the utility of spelling errors, followed by a review of the two prominent theoretical approaches, developmental and information processing that propose to account for the presence of spelling errors. Finally, out of these theoretical positions, objectives are presented along with an outline of an appropriate method and analyses.

A Rationale

Any empirical investigation should satisfy two criteria, one of practical utilitarian benefit and the

other of theoretical value. Admittedly an investigation into the consistency of spelling errors at first glance would not appear to satisfy either, but upon closer attention this changes.

As Moseley (1974) and Yule (1986) point out learning to spell is not a simple task. English spelling lacks an alphabetic advantage of a direct relationship to spoken language. It is not possible for early spellers to learn a simple set of rules and effectively apply them. Difficulty in spelling is not simply a function of the child's ability. There is also the historical trend of English derivatives of non-English words and class distinctions based on artificially created non-phonemic spelling since the Victorian times (Yule, 1986). The system of spelling we presently have is a result of a number of historical trends but is still one which children are expected to master.

Over the years teachers have started to take a diagnostic approach to instruction in reading, writing, spelling and math (Hillerich, 1982). It is no longer sufficient to state that a child has a spelling deficiency as that in itself does not provide any specific information for remediation. It is also of little value at times to administer standardized tests since they imply a certain amount of predictive validity that is subject to error.

For example the Boder test of Reading/Spelling Ability (1982) attempts to place those with reading/spelling difficulties into three different types. One shows an auditory-linguistic deficit (the dysphonetic), another a visual-spatial deficit (dyseidetic) and a third consisting of both (dyseidetic/dysphonetic). Conte, Samuels and Zirk (1983) point out that the measures used are sensitive and specific only to auditory-linguistic processing and not to visual-spatial so that the diagnoses of subtypes becomes unstable. Although Boder's model has stimulated a great deal of research, overall it has received little empirical support (Bryan & Bryan, 1986).

Standardized spelling tests due to their nature pay attention to certain stimuli while excluding others that may be relevant to that area and therefore have little use for the classroom teacher (Shlagal, 1986). In a diagnostic approach to spelling teachers can focus on specific error patterns which of themselves help to clarify the remediation that is necessary. An investigation of the consistency of spelling errors would show whether children's errors are systematic. If so then there is a benefit in doing an individual error analysis. On an individual level then this serves as a source of fruitful hypotheses regarding children's spelling that can be confirmed or rejected by further examples of the child's work (Bejar, 1984; Cramer, 1976; Ganschow, 1981; Weiner,

1980).

On a larger scale it is also of little value to say that Johnny has difficulty with words containing silent letters if a large proportion of children of the same age or grade also have that difficulty. This line of thinking has also prompted some calls for revision in the instruction of spelling. For children within a certain grade there may be considerable degree of variation in spelling ability. Authors such as Morris, Nelson and Perney (1986) propose using error patterns in order to guide instructional levels for spelling within a grade.

Of psychological and theoretical value is the opportunity to determine if there is an emergence and/or disappearance of certain error patterns occurring with maturation thereby supporting a developmental approach. In contrast, if spelling errors are found to be randomly distributed and not specific to any age or grade then the difference between younger and older children could be attributed to the reduction of the number of error and error types. In this case younger children would show a greater number of random error types while older children would show fewer of each, presumably because information processing has become more sophisticated.

While the two theoretical approaches are not necessarily incompatible they do affect the issue of when

and how to teach. Those who adopt a developmental model are inclined to advocate a "child readiness" approach and the adoption of strategies in order to learn new spellings. Those that support an information processing model look at deficits in processing and emphasize stimulus features and word frequency. These positions usually polarize in the debate over whether spelling acquisition is taught or caught as a result of incidental learning (Peters, 1985; Stewig, 1987).

A study into the consistency of spelling error patterns would appear to satisfy both of the original criteria.

Theoretical Review

As referred to earlier, research into spelling ability falls under two broad theoretical areas; those theories that view spelling acquisition as developmental in nature and those that concentrate on the cognitive information processing models. In a number of ways it could be argued that these theoretical areas are not necessarily incongruent with each other since a child may require aspects of both in order to acquire spelling skills. It is common sense that a child simply does not learn to spell because he has reached a certain point in maturation or possesses a good auditory or visual memory. A

great deal of variation can take place due to other factors such as teaching styles, curriculum emphasis, general motivation factors and classroom atmosphere, variables that cannot be controlled easily. The grouping of a number of different approaches under "broad theoretical areas" is done for clarification of their central themes and not as an attempt to determine if one is more important than the other.

Developmental Approach

Within this approach explanations range from development due to the acquisition of strategies in responding to increasingly complicated spellings, to the limitations placed upon adoption of spelling strategies attributed to psychological/maturational factors. These are not two easily defined areas as they admittedly acknowledge the importance of the other. For instance Marsh, Griedman, Welch and Desberg (1980) define strategies as an "active change in processing modes to accommodate task demands". In assessing these strategies a task analysis is often done in order to identify those strategies that would be required to develop so that words could be reproduced. When children develop as spellers their strategies often change to accommodate more complex words. The primary emphasis is placed on developing strategies in response to stimuli, so in effect change is

prompted by the presentation of more complex print from external sources. Change in this sense would respond to curriculum changes that follow the school year.

Marsh (et al, 1980) in their study used psuedo words in order to access strategies that had been developed by children in the second and fifth grade as well as students in college. They found that by the second grade children were able to deal with orthographic patterns succesfully. By the fifth grade there was a shift in strategy for spelling a new word by analogy to known words.

Previous work by Read (1971) demonstrated that by the time children enter school they possess a crude system of developed spelling. This he attributes to a need for expressing language in written forms. Hanna and Moore (1953) have pointed out that a child has a greater vocabulary of spoken words compared to a relatively smaller number of words that can be written. This prompts the need for the child (since literacy is a valued and essential development in industrialized societies) to be able to understand and reproduce their vocabulary into visual forms. In order to do this different authors propose that children go through identifiable stages in learning to spell (Anderson, 1985; Bookman, 1984; Gentry, 1978, 1982, 1984; Gentry & Henderson, 1981; Henderson & Templeton, 1986). Gentry (1982,1984) has identified five

such stages. These stages are precommunicative, semiphonetic, phonetic, transitional and correct. These stages center around the types of errors that children make and so help to determine those features that a child needs to study further in order to progress to spelling accuracy (Henderson & Templeton, 1986).

In the precommunicative stage the child uses alphabetical symbols to represent words. There is generally some knowledge of the alphabet, but no understanding of letter-sound correspondence. Children will frequently mix numbers and uppercase and lowercase letters as an expression of their natural hypotheses about symbol-sound relationships. With the semiphonetic stage the child begins to conceptualize that letters have sounds and that there are partial connections between phonetics and words. A few letters may represent the entire word. In the phonetic stage a child is able to produce total letter-sound correspondences. All surface sound features of words are represented in the spelling in addition to a systematic process for spelling emerging for phonetic details such as tense and lax vowels, preconsonantal nasals, etc. Read (1986) found that children in the primary grades are influenced by the phonetic characteristics of words and that children spell by learning sound-letter correspondence rather than the visual features of a word. Read claims that some of the phonetic

representation can be subtle and not as easily identified as surface phonological features.

During the transitional stage a basic adherence to English orthography emerges. It is during this stage that visual strategies for representing words are evident. All the appropriate letters may be included, but segments may be in the reversed order. There is as well the ability to differentiate spellings that involve the same sound. The conditions under which they apply may be only partially understood so that all words or segments do not necessarily reflect this development. The correct stage may reflect an extension of existing strategies. Presumably if enough sound-spelling correspondences are learned and the child can understand the concept of non-phonetic irregular spellings then strategies may be fixed by this point. Beers, Beers and Grant (1977) in examining spelling for grades one to four found that regardless of the type of instruction that children receive, they use three clearly defined strategies in spelling words. There is a dependency on the pronunciation of letter sounds to represent vowel sounds, insertion of an incorrect vowel after a correct vowel due either to hearing two vowels or an attempt to use silent vowel markers or the substitution of one short vowel for another short vowel. In addition, even though children demonstrated an ability to use "advanced strategies" with

familiar words, in the face of unfamiliar words they relied on prior primitive strategies.

Downing, Coughlin and Rich (1986) examined the way children in grades 3-4 and 6-7 conceptualized spelling by having them reinvent words and writing down an explanation for the reconstruction. They found that as children mature so do their conceptualizations of spellings. Older children's theories were more elaborate than those of younger children. While older children's explanations were generally more sophisticated the greatest proportion of reasons given for the change in both groups were phonological. This the authors attribute to the fact that historically, English orthography was a phonemic representation which carries to this day or alternatively that teachers may emphasize decoding in their instruction.

Zutell (1980) draws a closer parallel in the development of strategies to the transition between Piagetian stages, specifically from pre-operational to concrete operation. Children in the pre-operational stage rely on sound-letter correspondence in order to spell while children in the concrete-operational stage are able to "decentralize" and accommodate spellings that do not follow sound-letter correspondence.

At the far end of the developmental spectrum, Elkind (1974) (cited in Beers, 1980) Epstein (1979), Johnson

(1982) and Horst and Johnson (1982) see the entire process of language development and its forms (reading, writing, spelling) governed by the maturation of the child, rather than the complexity of the stimuli. Elkind (cited in Beers, 1980) states that children will not deal with the conceptual idea of letters until they have attained that level of thought through maturation. Epstein (1979), Johnson (1982) and Horst and Johnson (1982) propose that brain development and hemispheric specialization follows "growth spurts" that parallel Piagetian stages. Presumably, until this maturation takes place the child will not be able to formulate the appropriate strategies to deal with more complex stimuli. The evidence that Epstein (1979) presents is neurological and involves the myelination that occurs from age intervals of three to ten months, two to four years, six to eight years, ten to twelve and fourteen to sixteen or seventeen years. If as they claim, reading, writing and spelling are optimally developed at these age levels then one could expect to see an optimal adoption of strategies to produce correct spellings at these times and a larger number of random spelling errors between these ages. Plateau effects should then be present. To date no empirical evidence exists to support this hypothesis.

There is a question of whether spelling, reading and writing require the same developmental contingencies

either task related or maturationally related. Research generally falls into two areas, those that show that spelling acquisition occurs in parallel with reading and writing and those that propose that they are different processes. There is more support for the latter than the former.

Marsh (et al, 1980) and Barr and Lambourne (1984) have found that the specific reading task and specific writing task require the use of different strategies that become situation specific. Groff (1984) found by analyzing word familiarity and spelling difficulty that learning to spell was different than learning to read and understand written words. This he based on results that word familiarity did not necessarily predict accurate spellings. In a study comparing backward and normal readers, Bradley and Bryant (in Bradley, 1983) discovered that learning to read and spell in the earlier years (ages 6-7) are independent processes. These processes become less independent with age. Mann, Tobin and Wilson (1987) have found that to some degree phonological awareness in kindergarten children's spellings predicted reading ability in grade one. This is not to say that reading and spelling are identical processes but that overall phonemic development is needed for success in both.

Juel, Griffith and Gough (1986) in a longitudinal study of first and second grade children found that the development of spelling and word recognition depend on phonemic awareness. Finucci, Isaacs, Whitehouse and Childs (1983) in studying the relationship between spelling errors to such factors as reading ability, sex, grade and intelligence found that those who had a specific spelling disability did not differ from normal readers in the types of spelling errors made, only the number. As well they found no consistent effect for I.Q., grade or sex as to the type of errors made. However, their data came from the spelling section of the WRAT which does not control for error types but evaluates only the occurrence of errors. Bachman, Bruck, Hebert and Seidenberg (1984) found that good readers in grades two to four are able to expand their knowledge of spelling-sound correspondence and can rapidly learn high-frequency words with visual strategies alone. Younger children who read well and older children weak in reading generally use the same phonetic strategy. This corresponds with earlier findings by Carpenter (1983) and Moats (1983) for spelling strategies among readers and Holmes and Pepper (1977) for error types. Waters, Seidenberg and Bruck (1984) found that between children and adults the development of reading skill also shows an improvement in reproducing words with irregular non-phonetic spellings.

In summary, while the developmental theories do show considerable variance, they mutually emphasize that acquisition of general language arts and specifically spelling follow certain predictable trends in going from a point of no spelling to spelling ability. These trends are precommunicative, semiphonetic, phonetic, transitional and correct. In addition there is the underlying theme that a breakdown in spelling ability occurs because a child has become stagnated at one of the essential stages or at some place in their cognitive understanding and development.

Information Processing Theory

In contrast to the developmental theories with their emphasis upon a continual acquisition of spelling ability, Information Processing theories emphasize the functional processing qualities of spelling in accounting for errors. In addition, one spokesperson, Groff (1986) criticizes the use of developmental stages due to the lack of statistical evidence and adequate performance norms. Often, he states, the parameters of developmental spelling levels are subjectively and not empirically defined. While Information Processing theories may appear different they share a commonality in their emphasis on input and output. Previously, theories that explained spelling deficits often emphasized brain tissue damage, however the current trend is to identify those sets of cognitive

deficits responsible for a spelling disability. Another common feature is that they often propose a dual route processing feature that accounts for phonetic and non-phonetic spellings (Gerber & Hall, 1987).

Jorm (1985) proposes the use of a mental lexicon in spelling frequently used words or highly irregular words. Without the use of this lexicon we would not be able to spell irregular words. Jorm points to the large number of words that do not follow sound-print rules and so the necessity of this lexicon. If confronted by words for which we do not have lexical information then a mechanism of sound-print rules comes into effect. Since many spellings are possible that would be phonetically correct another process occurs involving the most appropriate alternative using orthographic rules.

In a study of children with reading and spelling difficulties Jorm (1981) reported that those with problems in reading and spelling were deficient in those words that required rules in order to be produced. Those who had difficulty with spelling only, had adequate use of correspondence rules, but difficulty in the selection of possible choices of phonetic spellings. Earlier work by Nelson and Warrington (1974) (cited in Jorm, 1983), Rourke and Sweeney (cited in Rourke 1983) reported that those who were phonetically innaccurate in their spelling had a

breakdown in language abilities while normal and phonetically accurate spellers are basically the same in applying basic operations in reproducing words. In one additional study Codeire, Sweeney and Rourke (cited in Rourke, 1983) compared normal, phonetically accurate and phonetically innaccurate children on spelling recognition, visual closure, visual memory and phonemic segmentation. It was found that younger phonetically acccurate spellers had difficulty in spelling because they could not go beyond phonemic representation of words and the use of visual gestalts, however they were not different than normals in visual memory. This Rourke suggests, would indicate on over reliance on phonic strategies where other skills are sacrificed. In contrast phonetically innaccurate children had difficulty with phonemic representation, phonemic retrieval, phonemic synthesis and a deficiency in visual memory. While Rourke looks at deficits in information processing he does acknowledge the importance of development which underscores the non-exclusionary status of both theoretical positions.

In contrast Goyen and Martin (1977) reported no support for the division of phonetically accurate and innaccurate among a group of thirteen and fourteen year old boys. They found that spelling accuracy was a reflection of word frequency and not orthography. Both phonetic and non-phonetic abilities intercorrelated on one factor of

general verbal intellectual ability. However the generalizability of their claims may be limited by the age and sex of their sample.

Ehri's Word Amalgamation Theory (1980) also proposes a lexicon but there is not the duality of processing that occurs with Jorm's theory. Ehri states that spelling and reading are synonymous developments and in the course of their development an additional component, the orthographic structure is added. This is incorporated as a sequence of letters that have a systematic relationship to the phonological properties of words. The lexicon contains words with phonological, syntactic and semantic material and the additional orthographic structure. A precursory development is a familiarity with the symbolic nature of letters. Those spellers who have a knowledge of letter-sound mapping will form better relationships between conventional spellings and word pronunciation. As the repertoire of words grows, new patterns of matching print into speech are added. Once the visual representations of words are located in memory they provide the phonological, syntactic, semantic and orthographic information for spelling and reading. The orthographic forms also allow the representation of words with silent letters and non-phonetic spellings. In this sense one would not find an acquisition of phonetic and non-phonetic spellings as eventually through expansion of the lexicon

all words take on phonetic properties where different letter combinations take on phonetic qualities.

In a series of experiments Ehri (1980) reported that children do use orthography as a representational system for storing speech sounds in memory. This allowed them to produce CVC (consonant/vowel/consonant) sequences of pseudo words and to incorporate silent letters in these words. Recently Ehri, Wilce and Taylor (1987) found that because children often have difficulty in the pronunciation of vowel sounds, orthography helped to categorize vowel sounds. In learning to spell, sounds are isolated and letters selected to symbolize these sounds. This would imply a symbol-sound rather than a sound-symbol direction. Ehri (et al) explain "If vowels are extracted innaccurately, perhaps because the consonant context yields a raised vowel or because the speller pronounces the vowel differently, then incorrect letters may be selected". Orthography then serves to limit the variability of vowel sounds by its imposition of precise categories on vowels which help the memorization of correct spellings. One would then assume following her line of reasoning that spelling errors occur due to faulty orthographic representation in the lexicon. Either the word was incorrectly represented in the lexicon initially or in the process of producing it faulty amalgamations were made. The theory proposes that correct spelling is a summation or

amalgamation of the different featural structures of a word and so possibly an innaccurate spelling doesn't take into account all associative features.

The logogen model, was proposed by Morton to explain separate stages of processing of all linguistic material. The most recent revision of the model (1980) contains three separate systems for processing material, the visual input logogen system, the auditory input logogen system and the output logogen system. Logogens are essentially evidence collectors that act through the sensory modalities (in this case the visual and auditory) with two thresholds in processing information. When the first threshold is exceeded a code is transmitted to the cognitive system. When the second threshold is exceeded a code is sent to the output logogen system. The output logogen system produces phonological codes and sends them to a response buffer. The response buffer takes the "semantic codes" from the cognitive system and the one to one mapping at the morphemic level from the input logogen system and decides upon the appropriate output and those steps necessary to complete it. Most likely spelling errors occur with the phoneme-grapheme system between the visual/auditory input system and the response buffer. This would be presumptive of some automatic processing, but would also require a feedback loop to account for checking spelling correctness. Morton states that this may involve the use of a mental

lexicon which is not adequately included in his model. Morton admittedly acknowledges that there is some dissatisfaction in the present version of the model to account for spelling errors. Research that focuses on spelling to support the logogen model is not available.

Morton's response buffer in spelling is taken up by Wing and Baddeley (1980). Words and specifically letters are stored in this buffer in a linear fashion that correspond to the spatial order of letters in the visual word. Handwriting as an output of spelling involves the retrieval of letters that have been encoded. In the production of spelling words the motor responses slow up the retrieval of those letters that occur at the end of the word. They hypothesized that if this was the case then letters at opposite ends of the word have fewer neighboring stimuli (letters) and should show less interference with memory traces for serial letters. Errors then should occur in the center of words due to the number of neighboring letters that would interfere with memory traces. In their research analyzing serial order of spelling errors in adults they found that a concave down bow shaped serial position curve occurred. This was found for reversals, substitutions, omissions and insertions. Groff (1986) found a positional effect but not in the serial order of letters in a mispelled word. Errors occurred in consonant letter patterns for children from

grade two to four. The effect of consonant letter clusters decreased as children grew older.

In summary, information processing theories attempt to account for spelling by either the processing of qualitative information (phonemic/non-phonemic) or attention to visual features of words involving storage and output. Errors are thought to occur due to breakdown in the system, but differences of phonetic and non-phonetic spellings are accounted for by the use of a lexicon.

Objectives

Having outlined a rational for spelling error analysis and discussed the different theoretical models, the specific objectives of this research can be clarified. The first objective is to determine whether the types of errors a child makes are consistent over a period of time. Included in this is the calculation of percentages of children that make any specific type of error and the frequency any particular error. In addition it will be determined if there is a difference between boys and girls and grade levels.

Secondly, ability (good, average and poor spellers) will be taken into account in order to determine the number of errors made under each error type. In this it will be assessed if there is a difference between spelling

abilities and grade levels in order to determine if good, average and poor spellers differ only in the number of errors made or by the types of errors made.

Next, if there are differences in error types either qualitatively or quantitatively, it will be determined if these differences can be explained by the use of different strategies or by a failure to use different strategies.

Finally it will be worthwhile to observe if there is a difference between grade or ability levels in where the error occurs. If certain error types are associated with certain positions in a word they can they tell us something about where spelling breaks down for a child.

Method

Subjects

A request was made to a local school board for three classes for each grade between grade two to eight. Three classes were selected due to a high attrition rate usually found in research in school settings, and secondly, it was felt that it would be too disruptive to specifically select a set number of students. The number of children participating came out to 71 for grade two, 90 for grade three, 62 for grade four, 74 for grade five, 74 for grade six, 83 for grade seven and 74 for grade 8. All children attending those classes were included regardless of educational status. A letter of request was sent to school principals asking for the voluntary participation of their teachers. For those that responded indicating that they would cooperate a briefing session was held outlining the study and the instructions for administration. Once the study is completed a complimentary summary report will be forwarded to the schools.

Test Materials

In order to test the above objectives Spaches's (1981) word lists were presented to children from grades two to eight over the span of thirteen weeks. The word lists were

taken from the Spache spelling errors test and are constructed to look at the probability of errors within thirteen error types. This data is part of a much larger collection of data including dictated sentences containing a key word and spontaneous compositions.

Spache's word lists contain words from the Gate's word lists and were selected so that a single type of error was common in more than 50 percent of students. In addition the lists were compiled for grades two to four, five to six, and seven to eight. Each word list consisted of one hundred and twenty words and was divided into five sections containing twenty four words for ease of administration. In addition to this data other information such as sex, grade and age was collected. All materials were included in a kit complete with a manual designed for ease of administration. A description of the kit and a copy of the manual can be found in Appendix A.

While Spache has published some rough norms the stability of the error types has never been empirically established. He claims that all potential error types can be covered by the thirteen error types he has outlined. Certain error types are not covered that may prove to have empirical and diagnostic significance, for instance substitution of words, certain nonphonetic syllable substitutions, etc. These were added to the above fourteen

error categories resulting in twenty one error types. The error types and their criteria can be found in Appendix B.

A preliminary error analysis was conducted using one hundred words that contained errors. This was done in order to assess the criteria for scoring the individual error types and to make readjustments if necessary. After some adjustments it was found that all errors were classifiable according to the error categories and criteria outlined. In order to assess the reliability of the individual error types Cronbach's alpha was calculated once the error analysis for all errors collected was completed. Three error types: omission of a syllable, homonym and the non phonetic syllable substitution were dropped because they occurred infrequently and contributed little if any variance. For the remainder of error types alpha was calculated to be .6655 with a standardized item alpha of .7920. While alpha is not at a point that would be acceptable for a clinically diagnostic test, given that this research is somewhat exploratory the error types could be considered to have a fair degree of reliability.

Administration

Administration took place over a thirteen week period by the class teacher. The administration was designed to be

as unintrusive as possible on class effort and time. The administration consisted of five sessions spaced out over thirteen weeks. Each session occurred every three weeks where a word list was presented. All work was done in class. The teacher was allowed flexibility in deciding when the materials would be administered, but a request was made that it be done as close to the beginning of the week as possible. The schedule and instructions for administration are found in the manual (Appendix A). Every week the responses were collected from the respective schools and prepared for analysis.

Analysis

Once the data was collected, the analysis proceeded in a number of steps. First an error analysis using the modified Spache classification system (1981) was conducted. Each error was entered on a scoring form and then the appropriate error types checked off. Only those words containing clearly defined errors were included. A word was regarded as correctly spelled using either Canadian or American conventions or if a letter was reversed. A reversal in this case means where a letter is printed or written backwards rather than a sequence of letters.

Testing children in a school system under natural conditions presents a number of problems regarding experimental control, but if one is to use this population for research these problems have to be tolerated at times and control exercised in the subsequent statistical analysis. Children may fail to show up, it may be difficult to control the school environment and when teachers are facing work pressures there may be the tendency to rush children through a task or postpone it to another time. The time span for testing lasted from October to March with the first three word lists completed before the Christmas break and the final two lists after the break. Therefore it made sense to collapse the first two and the last two testing sessions to create two testing times for analysis.

Conducting research using this many subjects also presented certain data and statistical problems. For one, the large number of zeros in the data tends to minimize the mean while grossly inflating the standard deviation. In addition the data tends to be highly skewed (although in this case all variables were positively skewed). Blair (1981) has discussed this problem and states that educational data tends to be anything but normal. Frequently one finds ceiling and floor effects, the presence of large minority groups and heavy and light tail distributions. All of these characteristics have consequences for the validity and power of t and other

tests. Difficulty arises in meeting the usual assumptions (especially homogeneity) when using analysis of variance.

The violation of homogeneity of variance is a topic that to some extent remains a source of controversy. In a large amount of published research (if not almost all) the violation of assumptions upon which one's conclusions lie is rarely discussed. Glass, Peckham and Sanders (1982) point out that all mathematical models are false to a greater or lesser extent so paying attention to the violation of assumptions is important. The relevant question becomes how serious are the consequences on the validity of statements based on these assumptions if and when they are violated.

Testing for homogeneity of variance has its own unique problems as it has been shown that the usual tests (Bartlett's, Hartley's F Max, Cochran C, Box M) are severely affected by the distribution of the data (O'Brien, 1981;OBrien & Kaiser, 1985). Because hypothesis tests detect violations from a perfect null situation they lack robustness and generally do not indicate when violation of a particular assumption is problematical for a particular procedure. O'Brien and Kristen (1985) generally recommend against their use.

In the case of heterogeneous variance and unequal sample sizes, if the larger sample sizes correspond to the

larger variance than the usual analysis of variance can remain robust (Milliken & Johnson, 1984). If variance is heterogeneous, but sample sizes equal analysis of variance again remains robust. Furthermore if populations are similar in shape (all positively or negatively skewed) or the the largest variance is no more than four to five times the smallest, analysis of variance is most likely valid (Howell, 1987).

When assumptions are violated there is the option of using non parametric tests although there is not overall agreement on the issue of parametric vs non parametric. Using non parametric tests when the variance is heterogeneous has been recommended on the other hand, however a number of authors have shown that non parametric procedures are also affected by heterogeneity of variance (Tomarken & Serlin, 1986). Secondly non parametric tests are usually not considered as powerful, and if it is at all possible, keeping in mind some of the problems outlined above, it is generally recommended that parametric tests be used.

In order to overcome the problems of too many zeros in the data and heterogeneity of variance the following steps were taken. For each error type only those cases with values greater than one were selected. This did have the effect of reducing the n (considerably in the case of

some error types) but allowed for a clearer picture of the effect of time and the percentage of children who make such errors. Sample sizes were equalized by random selection to an identical number per group.

While table one presents the percentages of errors made by children across grade levels, in order to effectively test for the time effect only those error types that accounted for ten percent of children were used. When it came to anything less than ten percent group sizes were too small to be effectively tested. This proved more than adequate for testing grade by sex by time, however it fell short as a solution for taking into account spelling ability. Ability was determined by taking the number of words which contained errors, not the number of errors and creating groups using the mean and standard deviation. This was done because it was found that the number of words containing errors did follow a normal distribution. Those children scoring withing one standard deviation of the mean were classified as average spellers while those below one standard deviation were good spellers and those above one standard deviation were poor spellers. Dividing sample size into good, average and poor spellers produced consistently low numbers for good spellers. Trying to equalize the number in each group for all variables under most errors would have meant groups sizes of two to five subjects per group. Taking into account the problem of

heterogeneity of variance this would have stretched the violation of assumptions to a point that would have been considered unjustifiable.

In order to test for the effect of ability the five testing sessions were collapsed which also allowed for the inclusion of those error types that had been previously omitted under time. However good spellers still accounted for a low n per grade and ability so the analysis had to be completed using average and poor spellers.

Results

The purpose of the first analysis was to identify the percentage of children who make the same type of error at the first and second time and secondly to see what effect time has for each error type.

Table one contains the percentage of children who make the same errors at times one and two. The greatest percentage of children make phonetic vowel substitutions for all grade levels, followed by non-phonetic consonant substitutions although this declines across grade levels. Non phonetic vowel substitutions increase by grades five and six and decline by grades seven and eight. A couple of error types, word substitutions and ommission of a sounded letter are rare occurring roughly two percent of the time across grade levels. Some error types (doubling the consonant, reversals) drop considerably by grades five and six while others (ommission of a silent letter, failure to double consonant, phonetic word and syllable substitutions) actually increase in the percentage of children that make them. Finally others (doubling the vowel, addition of a syllable, non-phonetic vowel substitutions) increase by grades five and six but decline by grades seven and eight.

While the percentage of children who make these types of errors varies the next step was to assess if the mean

Table One

Percentage of Children who make the same Error Type at
Times One and Two by Grade Level

Error Type	Grade Levels		
	Two to Four	Five and Six	Seven and Eight
Reversal	17.0	9.3	8.0
Doubled Vowel	31.0	49.0	20.4
Doubled Consonant	13.4	3.0	3.0
Failed			
Double Vowel	1.0	5.0	5.1
Double Consonant	22.0	46.3	43.3
Addition			
Vowel	13.4	21.0	11.5
Consonant	21.0	24.0	20.4
Syllable	33.0	44.0	40.0
Ommission			
Sounded Letter	2.2	1.3	5.1
Silent Letter	21.4	32.0	43.0
Substitution			
Phonetic			
Vowel	67.0	63.0	52.0
Consonant	29.0	16.0	21.0
Syllable	4.0	9.0	9.0
Word	10.3	10.0	15.3
Non-Phonetic			
Vowel	37.0	44.4	18.5
Consonant	46.0	30.5	19.0
Word Substitution	2.2	2.0	2.0
Unrecognizable	22.0	49.0	44.0

number of errors by error type changes. A mulitvariate analysis of variance (Manova) for error type (1) by grade level (3) and time (2) was conducted. Figure One and Table Two display the mean number of errors by error type for grade levels over time. Significance levels are indicated by asterisks. Preliminary analysis demonstrated that for all error types, sex of the child was not a significant factor (p > .05). A number of the graphs display a relatively flat effect for time across grade levels. In particular the ommission of a sounded letter, addition of a consonant and syllable show little change from Time one to Two. Non phonetic vowel and consonant substitutions show a gradual rise for all three grade levels although not substantial. Phonetic vowel and consonant substitutions do show some change between grades two to four, five and six and seven and eight however the change between grades five and six and seven and eight is minimal. Phonetic consonant substitutions for grades two to four is the only error type that increases substantially between times one and two but only for grades two to four. The only error type that shows a substantial decline are those that are unrecognizable for grades two to four.

While Table Two indicates that a number of error types show a significant difference between means for grade levels, time and grade level by time, with the exception of substitutions of phonetic and non phonetic

Figure One

Mean Number of Errors at Times One and Two for each Error Type
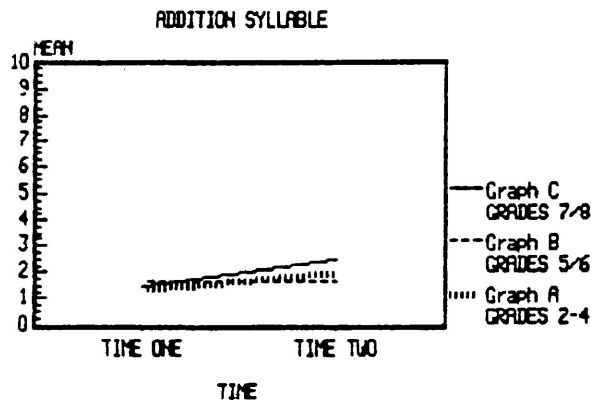by Grade Level

Figure One   (cont'd)

PHONETIC VOWEL SUBSTITUTION

PHONETIC CONSONANT SUBSTITUTION

NON PHONETIC VOWEL SUBSTITUTION

NON PHONETIC CONSONANT SUBSTITUTION

PHONETIC WORD SUBSTITUTION

UNRECOGNIZABLE
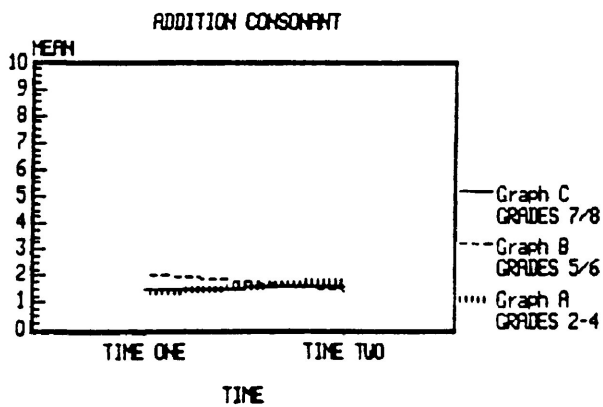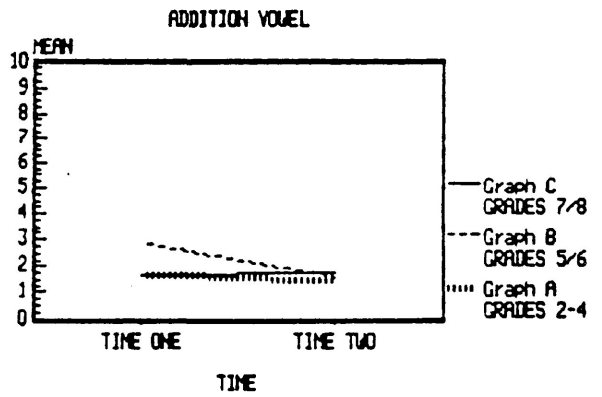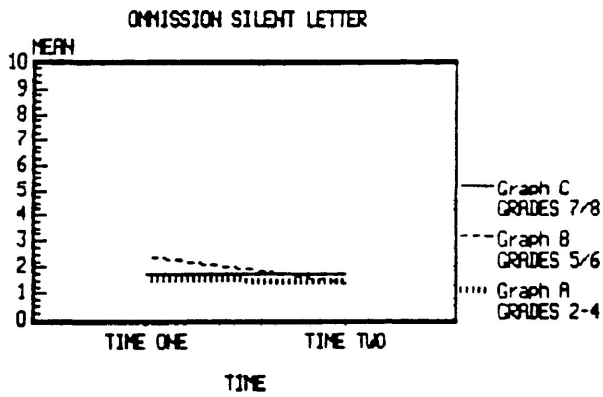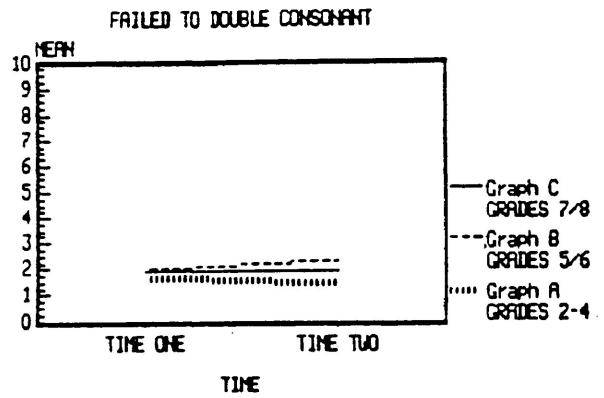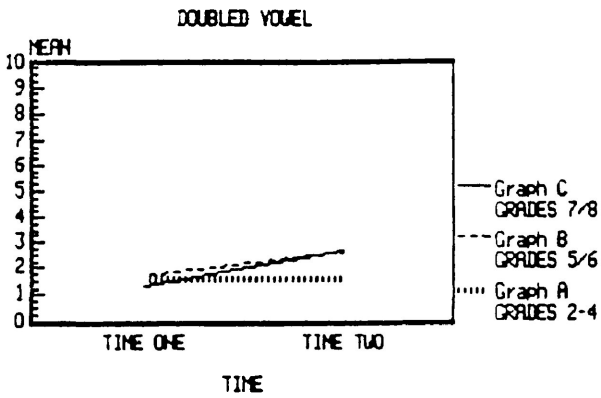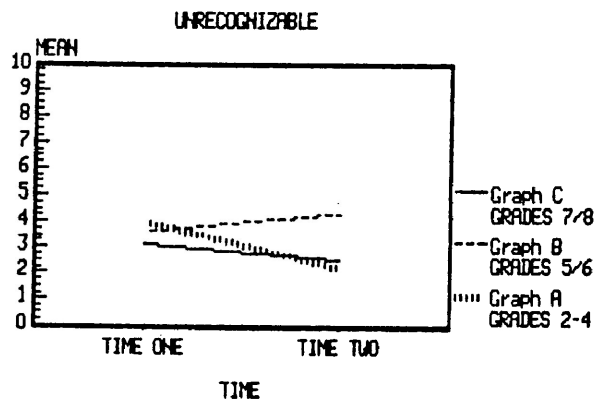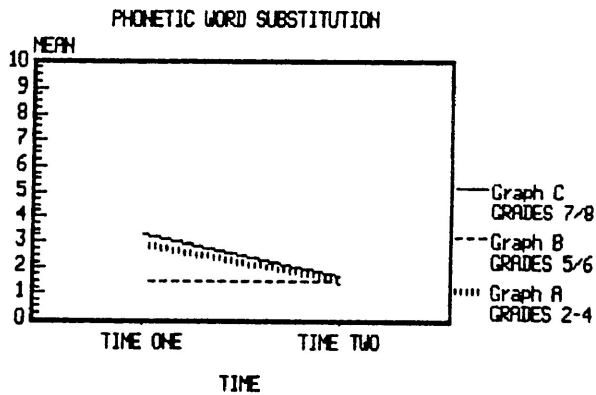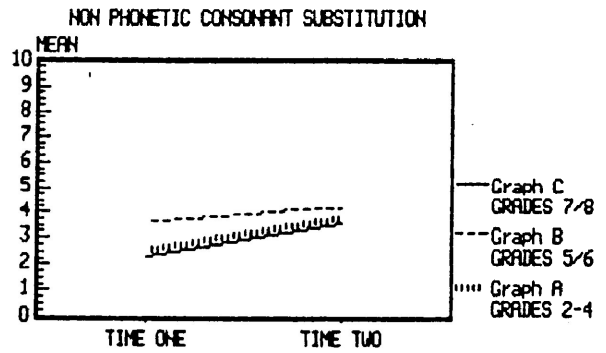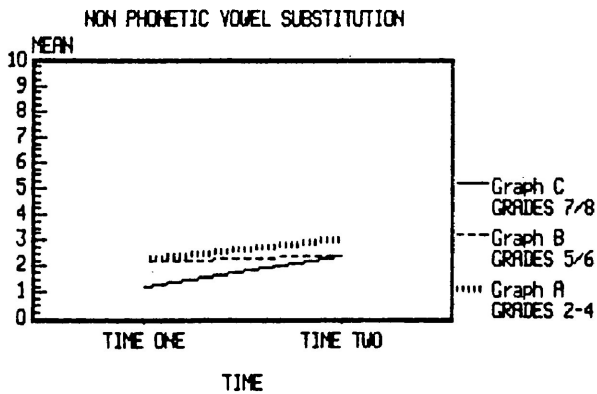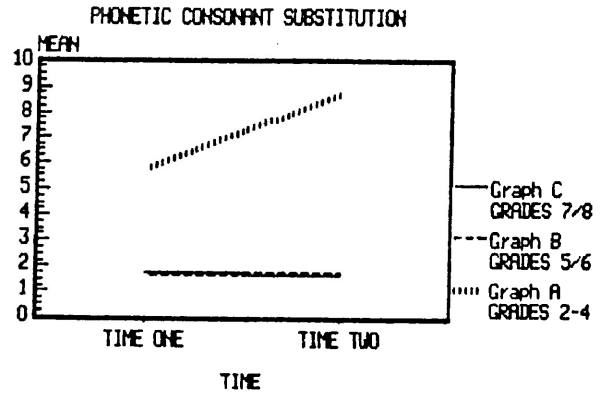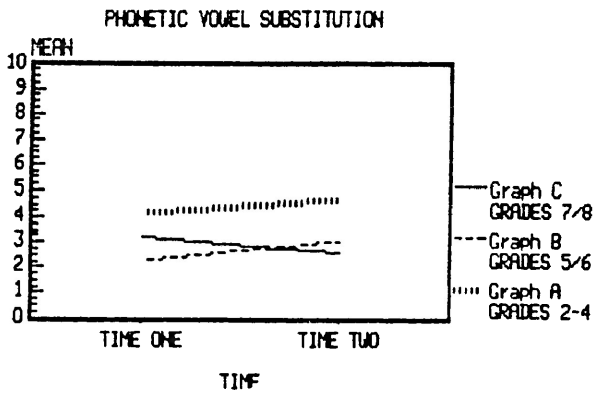
Table Two

Mean   Number of Errors by Error Types for Grade Levels over Time

| Error Type | Grade Levels | | | | | |
| | 2-4 | | 5/6 | | 7/8 | |
	Time 1 X	Time 2 X	Time 1 X	Time 2 X	Time 1 X	Time 2 X
Double Vowel	1.6	1.6	1.7	2.6	1.3	2.7**##++
Failed Double						
Consonant	1.7	1.4	1.9	2.3	1.9	1.9*
Addition						
Vowel	1.7	1.4	2.8	1.6	1.7	1.8
Consonant	1.3	1.8	2.0	1.4	1.5	1.6**++
Syllable	1.3	1.9	1.7	1.7	1.5	2.5**##++
Ommission						
Silent Letter	1.6	1.4	2.4	1.4	1.8	1.8**##++
Substitution Phonetic						
Vowel	4.1	4.6	2.2	3.0	3.2	2.6**++
Consonant	5.7	8.7	1.6	1.8	1.8	1.7**##++
Word	2.8	1.5	1.5	1.4	3.3	1.7##
Non-Phonetic						
Vowel	2.2	3.0	2.1	2.4	1.2	2.4##
Consonant	2.5	3.7	3.6	4.2	2.3	3.6##
Unrecognizable	3.9	2.1	3.6	4.3	3.1	2.5

Note: Significant levels for Grade   * p <.05
                                     ** p <.01
                         Time   # p <.05
                                     ## p <.01
                 Grade by Time   + p <.05
                                     ++ p <.01

vowels and consonants one could say that the differences between means are not all that great and in fact the difference between grade levels and/or time is minimal in spite of a low p value.

The next step was to examine individual error types without the effect of time. All five testing sessions were collapsed and the percentage of children making more than one particular error was calculated. These percentages are found in Table Three. Most error types change by only ten percent or less across grade levels with the greatest change seen in the substitution of a non phonetic consonant where there is a twenty four percent drop between grades two to four and seven and eight. The greatest percentage of children make a phonetic vowel substitution across grade levels which points to the absolute dominance of phonetic strategies.

Another way of considering this data is to examine the values that lie at various percentile points for each of the grade levels. In this way not only does one see the difference between grades but also between abilities. Table Four contains the values for each of the percentiles from the 50th to the 95th percentile. If the values for each of the percentiles between the 50th and 95th percentile at an interval of five are plotted (Figure Two) it becomes evident that difference is attributable to

Table Three

<u>Percentage of Children who make at least one Error by Error Type for each Grade Level</u>

	Grade Levels		
	2-4	5/6	7/8
Reversal	51	61	56
Ommission			
Sounded Letter	41	38	68
Silent Letter	77	79	90
Doubled			
Vowel	76	89	75
Consonant	43	40	49
Failed Double			
Vowel	46	32	37
Consonant	69	85	91
Addition			
Vowel	57	67	80
Consonant	79	79	80
Syllable	81	87	83
Substitution			
Phonetic			
Vowel	94	97	90
Consonant	74	58	80
Syllable	54	50	48
Word	73	44	55
Non-Phonetic			
Vowel	75	81	71
Consonant	80	65	56
Substitution			
Word	63	46	39
Unrecognizable	80	91	90

Table Four

Values at the 50th + Percentiles for each Error Type by Grade Level

Grades Two to Four

	Percentiles									
Error Type	50	55	60	65	70	75	80	85	90	95
Reversal	2	2	3	3	4	4	5	5	6	7
Ommission										
Sounded Letter	1	1	1	1	2	2	2	2	3	3
Silent Letter	2	2	2	2	3	3	3	3	4	5
Doubled										
Vowel	2	3	3	3	3	4	4	4	4	5
Consonant	2	2	2	3	3	4	4	4	5	6
Failed Double										
Vowel	1	1	1	1	1	1	2	2	2	3
Consonant	2	2	2	2	3	3	3	4	4	5
Addition										
Vowel	2	2	2	2	2	3	3	4	4	6
Consonant	2	3	3	3	4	4	4	5	6	6
Syllable	3	3	3	3	4	4	5	5	6	6
Substitution										
Phonetic										
Vowel	5	5	7	8	9	10	12	13	14	17
Consonant	2	3	3	5	10	13	15	17	21	24
Syllable	1	1	1	1	1	2	2	2	2	3
Word	3	3	3	3	4	4	5	5	6	8
Non-Phonetic										
Vowel	3	3	4	4	5	5	6	7	9	11
Consonant	4	5	6	6	7	9	10	11	13	18
Substitution										
Word	2	2	2	2	2	3	3	4	5	7
Unrecognizable	3	3	4	4	5	6	7	8	9	11

Table Four (cont'd)

Grades Five and Six

					Percentiles					
Error Type	50	55	60	65	70	75	80	85	90	95
Reversal	1	1	2	2	2	2	2	3	3	4
Ommission										
Sounded Letter	1	1	1	1	2	2	2	3	3	3
Silent Letter	2	3	3	3	4	4	4	5	6	6
Doubled										
Vowel	3	3	4	4	5	5	6	6	7	8
Consonant	1	1	1	1	1	2	2	2	2	4
Failed Double										
Vowel	2	2	2	2	2	2	3	3	3	6
Consonant	3	3	4	4	4	5	5	6	7	8
Addition										
Vowel	2	2	2	2	3	3	3	4	4	6
Consonant	2	2	2	3	3	3	4	4	5	5
Syllable	3	3	4	4	4	5	5	6	7	7
Substitution										
Phonetic										
Vowel	4	5	5	6	6	7	7	8	9	13
Consonant	1	2	2	2	2	2	3	3	4	6
Syllable	1	1	1	1	2	2	2	3	3	4
Word	1	1	2	2	2	3	3	3	3	6
Non-Phonetic										
Vowel	3	3	3	4	4	5	5	6	6	9
Consonant	3	3	3	4	5	6	8	9	13	17
Substitution										
Word	1	1	1	1	1	2	2	2	3	4
Unrecognizable	4	5	5	5	6	7	8	8	11	14

Table Four (cont'd)

Grades Seven and Eight

Error Type	Percentiles									
	50	55	60	65	70	75	80	85	90	95
Reversal	1	1	1	2	2	2	2	2	2	3
Ommission										
Sounded Letter	1	1	2	2	2	2	2	3	3	4
Silent Letter	3	3	3	3	4	4	4	5	5	6
Doubled										
Vowel	3	3	4	4	4	5	5	6	6	7
Consonant	1	1	1	1	1	1	2	2	2	3
Failed Double										
Vowel	1	1	1	1	2	2	2	2	2	3
Consonant	3	3	3	3	4	4	5	5	6	7
Addition										
Vowel	2	2	2	3	4	4	4	4	5	7
Consonant	2	2	2	2	3	3	3	3	4	6
Syllable	3	3	4	4	4	5	5	6	6	7
Substitution										
Phonetic										
Vowel	4	5	5	6	6	7	8	9	10	13
Consonant	2	2	2	3	3	3	3	4	4	6
Syllable	1	1	2	2	2	2	3	3	4	4
Word	2	2	2	3	3	3	4	6	6	9
Non-Phonetic										
Vowel	2	2	3	3	3	3	4	4	5	6
Consonant	2	3	3	4	4	5	6	7	8	12
Substitution										
Word	1	1	1	1	1	1	2	2	2	3
Unrecognizable	4	4	5	5	6	6	7	8	9	11

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Figure Two

Line Plot for Values at the 50th + Percentile Points for each
Error Type by Grade Level

REVERSAL

OMMISSION SOUNDED LETTER

OMMISSION SILENT LETTER

DOUBLED VOWEL

DOUBLED CONSONANT

FAILED TO DOUBLE VOWEL

Figure Two (cont'd)

FAILED TO DOUBLE CONSONANT

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

ADDITION VOWEL

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

ADDITION CONSONANT

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

ADDITION SYLLABLE

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

PHONETIC VOWEL SUBSTITUTION

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

PHONETIC CONSONANT SUBSTITUTION

—Graph C GRADES 7/8
---Graph B GRADES 5/6
·····Graph A GRADES 2-4

PERCENTILE

Figure Two (cont'd)

PHONETIC SYLLABLE SUBSTITUTION

PHONETIC WORD SUBSTITUTION

NON PHONETIC VOWEL SUBSTITUTION

NON PHONETIC CONSONANT SUBSTITUTION

WORD SUBSTITUTION

UNRECOGNIZABLE

ability rather than grade level for some error types. As a matter of fact at the 50th percentile a number of grade levels show little difference for the values at that point and continue to show little difference the further out towards the 95th percentile. These errors include the omission of a sounded and silent letter, addition of a vowel, consonant and syllable and the substitution of a phonetic syllable. In this respect by the second grade children are not adding a lot of extraneous information to a word and so could be said to possess a fairly good auditory and visual gestalt of the word they are attempting to spell. A number of error types which do show a moderate separation by the 95th percentile by grade level (reversals, doubled vowels and consonants, failure to double consonant) are similar in that they can be regarded as a result of a misplaced rule. This misapplication applies to rules that affect phonetic and visual information since failing to double the consonant and doubling the consonant affect only the visual correctness of the word and add nothing to its phonetic pronunciation. Doubling a vowel is an attempt to reproduce the long vowel sound as either doubling the vowel or adding a silent letter will change a short vowel into a long vowel. A number of reversals also reflected on phonetic possibilities since i before e will produce a long i sound (eg. die, flies) while e before i will the produce the long

e. The greatest separation comes in the number of phonetic
vowel and consonant substitutions that are made by children
at the 50th percentile and those at the 95th percentile.
Children in grades five and six and seven and eight are
closer, taking ability into account, than children in grade
two to four in   the number of errors made of these types
although children in grades five and six, seven and eight
show a greater   increase in the number of phonetic vowel
substitutions made than phonetic consonant substitutions.
This would indicate that across grade levels poor spellers
are able to reduce the number of phonetic consonant but
not phonetic vowel errors made. In contrast the number of
non phonetic vowel errors is not as steep by the 95th
percentile as are non phonetic consonant errors.

A second analysis was conducted to see if error types
could be accounted for by grade level or ability. The five
testing sessions were collapsed and a multivariate
analysis of variance for error type (1) by grade level (3)
by ability (3) was performed. Preliminary analysis (Manova
for Error type (1) by Grade level (3) by Sex (2) by
Ability (2) failed to detect a significant effect for Sex
(p > .05).

Table Five displays the mean standard deviations, F
ratios and significance levels for each error type by
grade and ability (average and poor spellers). Figure

Three displays line plots of means for each ability across grade levels for each error type. Again a number of error types show a relatively flat effect when grade and ability are taken into account. The doubling of a consonant, addition of a syllable and word substitution do not produce a significant difference for grade level, ability or grade level by ability. With the exception of phonetic and non phonetic vowel and consonant substitutions and words that were unrecognizable the other error types which do show a significant difference for grade level, ability and/or grade level by ability, show a difference between means that is rather small. Of particular interest is the doubling of a vowel where average and poor spellers start at the same point in grades two to four, however differ by the time they reach grades five/six and seven/eight. This could represent either the misapplication of the doubling of the vowel rule or a faulty phonetic strategy where a long vowel prompts a doubled vowel. A similar pattern is observed in the failure to double a consonant which would indicate that unlike average (and good spellers), poor spellers are unable to incorporate situational aspects concerning rule application. In the addition of a consonant, doubling of the consonant and the phonetic consonant substitution there is some differentiation between average and poor spellers in grades two to four however the gap closes by grades seven and eight. With the

Table Five

Means and Standard Deviations for each Error Type
by Ability (average and poor) and Grade Level

Average

	Grade Levels					
	2-4		5/6		7/8	
Error Type	M	SD	M	SD	M	SD
Reversal	2.3	1.6	1.8	0.9	1.5	0.6
Ommission						
Sounded Letter	1.4	0.9	1.4	0.8	1.5	0.6
Silent Letter	2.5	1.4	2.9	1.5	3.9	2.7
Doubled						
Vowel	2.9	1.5	4.0	2.4	3.4	1.6
Consonant	1.8	0.9	1.2	0.4	1.4	1.1
Failed Double						
Vowel	1.2	0.4	2.4	1.8	1.7	0.9
Consonant	2.1	1.2	3.3	2.1	3.1	0.9
Addition						
Vowel	1.7	0.9	1.8	0.8	3.0	2.2
Consonant	2.9	1.7	2.1	1.2	2.7	1.9
Syllable	3.9	2.3	3.6	1.8	3.4	2.0
Substitution						
Phonetic						
Vowel	6.1	4.6	4.8	2.0	5.5	2.5
Consonant	3.7	5.8	2.5	2.0	2.2	1.2
Syllable	1.2	0.4	1.4	0.6	1.8	1.0
Word	3.3	3.8	1.7	1.4	2.2	1.5
Non-Phonetic						
Vowel	3.6	2.3	3.2	3.8	2.3	1.5
Consonant	2.9	2.7	2.6	2.4	2.5	1.8
Substitution						
Word	2.1	1.8	1.4	1.0	1.3	0.6
Unrecognizable	3.6	2.7	5.2	3.0	4.6	2.0

Note: F ratios and significance levels for main effects on next page.

Table Five (cont'd)

Poor

Error Type	Grade Levels						(G) F	(A) F	(GxA) F
	2-4		5/6		7/8				
	M	SD	M	SD	M	SD			
Reversal	3.0	1.8	1.8	1.0	1.9	0.9	6.7**		
Ommission									
Sounded Letter	1.8	1.6	1.9	1.2	2.6	2.2		7.2**	
Silent Letter	2.4	1.4	4.8	3.2	3.1	1.8	5.2**		4.7*
Doubled									
Vowel	2.5	1.5	5.3	2.4	4.9	1.6	10.9***	5.7*	
Consonant	2.4	1.9	2.0	1.9	1.6	1.3			
Failed Double									
Vowel	1.3	0.5	2.3	1.7	1.6	0.7	4.5*		
Consonant	2.9	2.1	5.3	2.8	4.8	2.6	8.3***	14.4***	
Addition									
Vowel	2.3	1.1	3.6	1.9	4.3	1.8	11.7***	18.3***	
Consonant	4.0	2.5	3.8	1.7	3.4	1.9		12.3**	
Syllable	3.0	2.0	3.9	2.3	4.5	2.0			
Substitution Phonetic									
Vowel	7.9	7.6	9.2	4.6	10.1	4.2		18.3***	
Consonant	9.9	8.3	2.7	1.6	3.2	2.5	11.4***	8.8**	5.1**
Syllable	1.5	0.9	2.2	1.5	2.5	1.9	4.3*	8.5**	
Word	4.1	2.7	2.7	1.8	4.5	3.2	3.7*	8.6**	
Non-Phonetic									
Vowel	13.4	29.7	20.1	27.5	3.7	1.9		9.5**	
Consonant	8.7	5.0	11.5	7.0	7.2	4.2		66.2***	
Substitution Word	2.1	1.4	2.1	1.8	1.8	1.0			
Unrecognizable	8.3	8.2	14.5	12.9	8.4	3.3	4.1*	24.0***	

Note: (G) = Grade (A) = Ability (GxA) = Grade by Ability
Note: * p < .05 ** p < .01 *** p < .00
(Only those F ratios that reach significance are printed.)

Figure Three

Mean Number of Errors by Error Type, Spelling Ability and Grade Level

Figure Three (cont'd)

FAILED DOUBLE CONSONANT

ADDITION VOWEL

ADDITION CONSONANT

ADDITION SYLLABLE

PHONETIC VOWEL SUBSTITUTION

PHONETIC CONSONANT SUBSTITUTION

Figure Three (cont'd)

PHONETIC SYLLABLE SUBSTITUTION

PHONETIC WORD SUBSTITUTION

NON PHONETIC VOWEL SUBSTITUTION

NON PHONETIC CONSONANT SUBSTITUTION

WORD SUBSTITUTION

UNRECOGNIZABLE
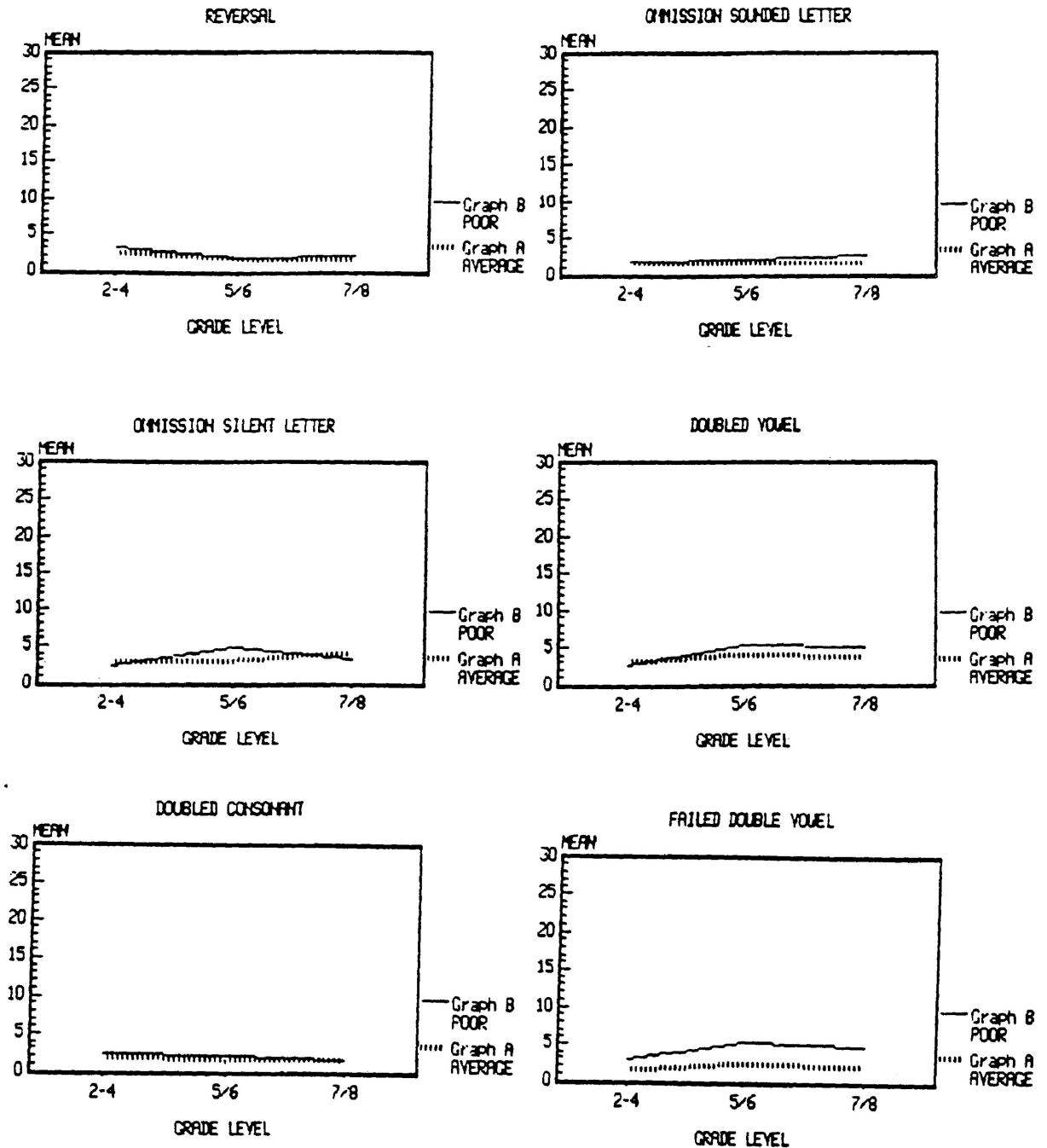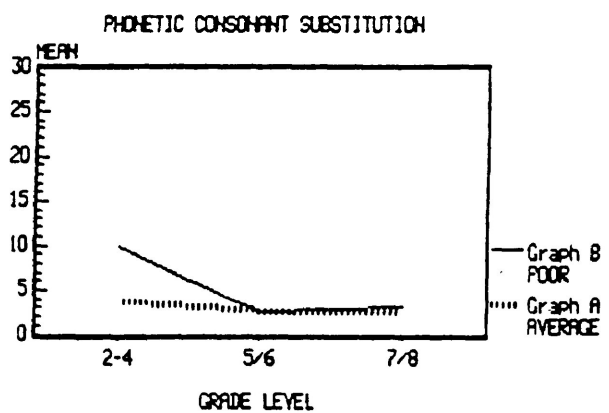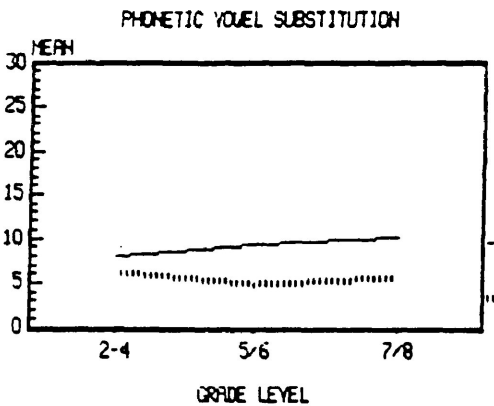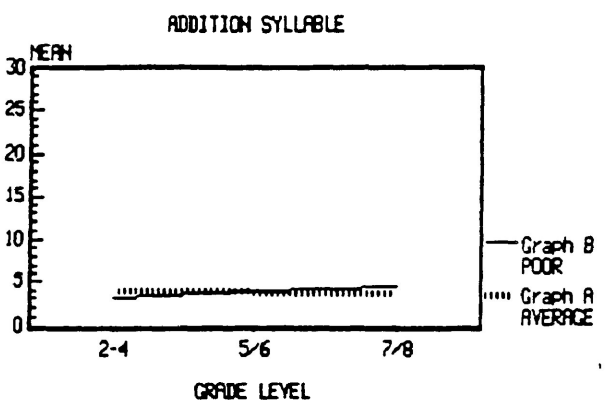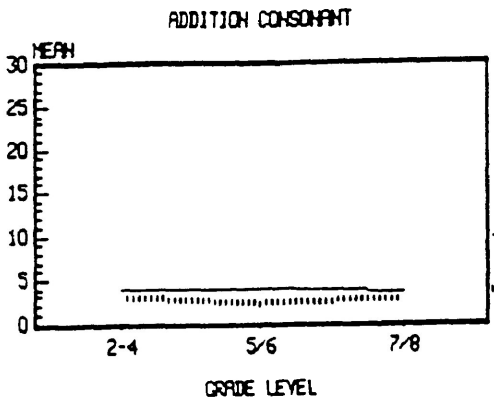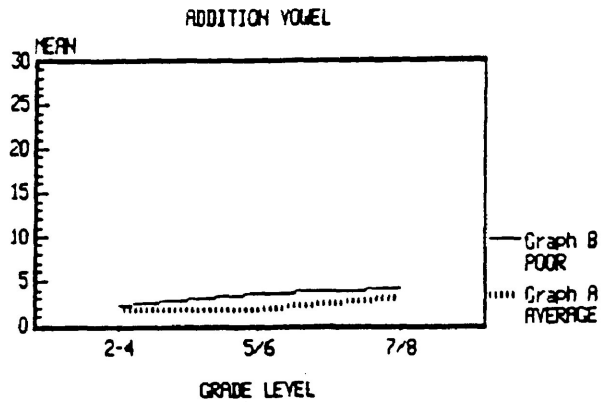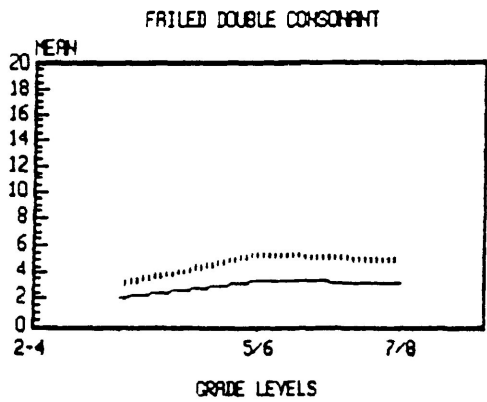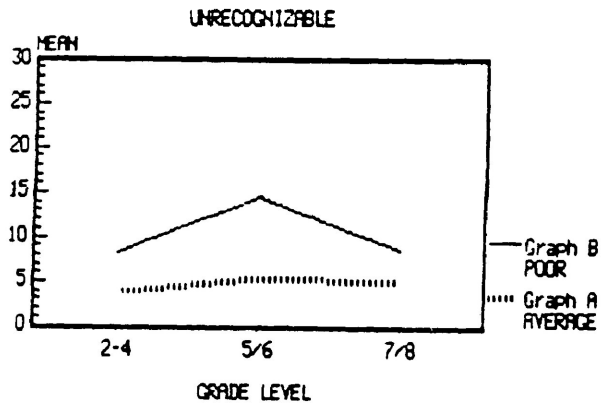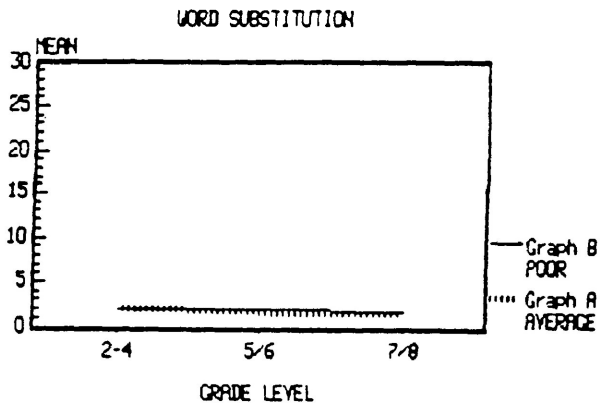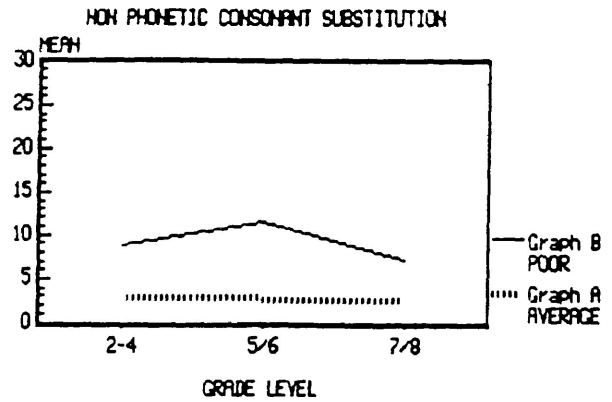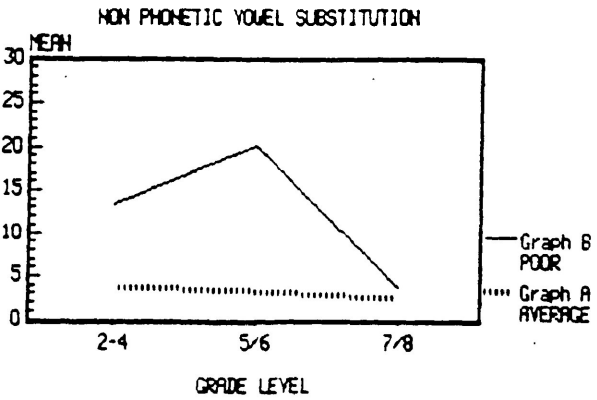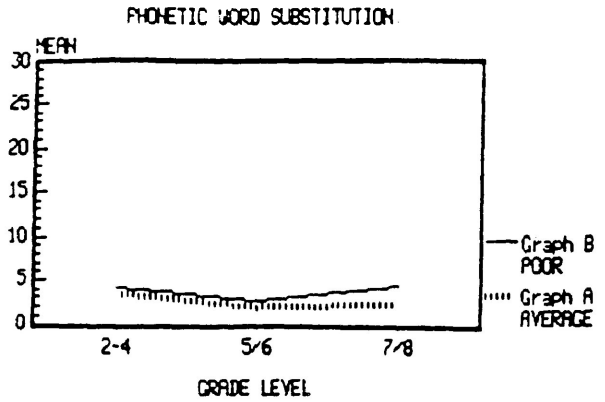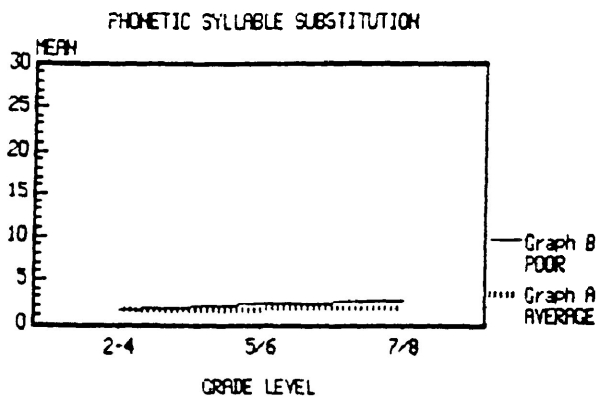
addition of a consonant and doubling the consonant children are able to realize that these represent extraneous visual information that is unnecessary to the correct spelling of a word. The fact that there is a substantial reduction in phonetic consonant substitutions by grade five demonstrates that poor spellers cease using auditory/phonetic cues in producing consonant letters in a word. Contrast this with the non phonetic consonant substitututin and it becomes evident that there is a substantial difference between poor and average spellers in their ability to handle unpredictable consonant sound-letter correspondences. This extends to non phonetic vowel substitutions but only until grade seven where they reduce considerably in number and come close to the number which average spellers make. One other major difference observed is in the number of unrecognizable words made by average and poor spellers. It is clear that there is a substantial (and significant) difference in the number of unrecognizable words made but what is not so clear is why the peak occurs at grades five and six. This peak also occurs with non phonetic vowel and consonant substitutions and to some degree the ommission of a silent letter. Given that all involve unpredictable letter-sound correspondence this could represent a particular difficulty that poor spellers have with visual memory which is not as profound by grades seven and eight.

It remains to be seen how poor spellers in grades five and six would have a poorer visual memory than in grades two to four or seven and eight. If this were so than one could expect to see a positive linear relationship between grade level and number of non phonetic vowel and consonant substitutions because of the increasing demand placed on visual memory due to greater complexity of word spellings. The more plausible explanation is that grades five and six represent a time where children are attempting to spell by analogy to familiar words or how they "think" a word should look. Since phoentic consonant substitutions decline considerably by grades five and six while phonetic vowel substitutions increase slightly and continue to rise by grades seven and eight, it is evident that in addition to greater difficulties with the transition to spelling by analogy poor spellers still rely on a phonetic strategy.

A final analysis examined where errors are most likely to occur and if certain error types are associated with the beginning, middle and/or end of a word. Some idea as to where the errors are occurring may help to clarify how increasingly complex words affect spelling ability. Earlier research (Wing and Baddeley, 1980) found an effect for word length that correlated with a greater number of errors occurring in the middle of a word than at the beginning or end. It had been hypothesized that less interference from neighboring stimuli at the beginning or

end of a word resulted in fewer errors in those positions. The final analysis did not concentrate on the length of a word but whether good, average and poor spellers were similar in this respect and furthermore if there are certain error types that are correlated with these positions. Therefore it takes into account not only where the error occurs but the type of error. Figure four contains line plots for error positions for good, average and poor spellers across grade levels. With some exceptions there are fewer errors made at the beginning of a word with a peak observed in the middle of the word and fewer errors at the end of a word. Good spellers in grades five and six show no difference in where they make an error in a word while the peak for average spellers is small. Poor spellers are the obvious exception. In grades two to four there are far more errors made at the beginning of a wod than at the middle or end. By grades five and six and seven and eight the number at each part levels off and in comparison to good and average spellers this may provide a clue to the difference between ability. Average and good spellers are able to adequately store and recall the beginning of a word which may aid in providing closure to the rest of the word. Poor spellers in the early grades are unable to retain or memorize visually or auditorally the first section of the word and therefore lack an important component which enables other children

Figure Four

Mean Number of Errors at the Beginning, Middle and End of a
Word for Ability by Grade Level
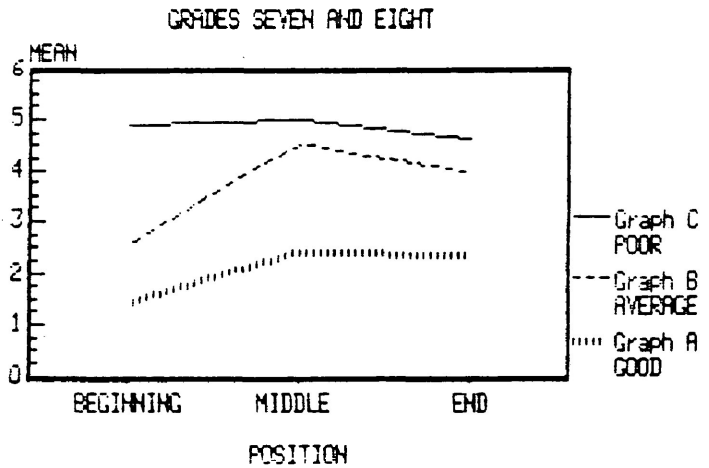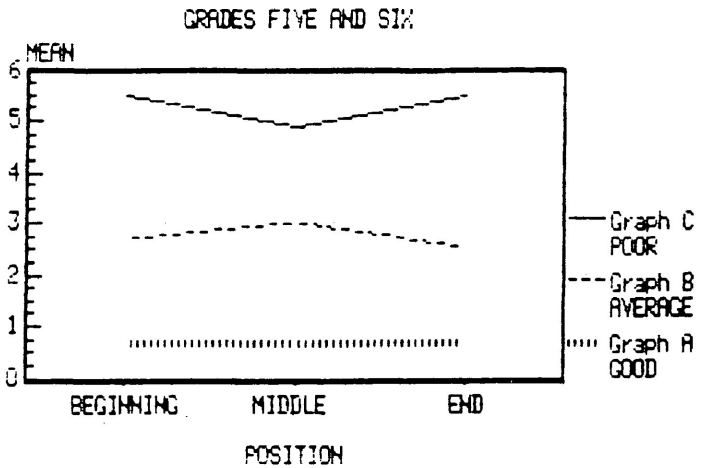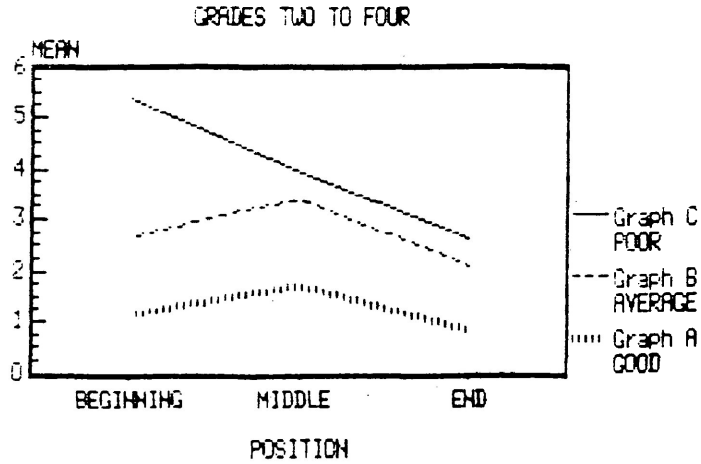
to spell those words. Taking into account the types of errors that occur at the beginning of a word for all ability levels will help to assess this.

Table Six contains the correlations of error types with the beginning, middle and end of a word by grade level and ability. Good and average spellers in grades two to four show a moderate correlation for the substitution of a phonetic consonant with the beginning of a word, while poor spellers in this grade level demonstrate a far stronger correlation of this error type with the beginning of a word. However for poor spellers other error types show moderate to strong correlations with the beginning of a word. These error types (reversals, doubling the consonant, and to a lesser extent the addition of a vowel and consonant) suggest that poor spellers lack the ability in beginning to spell a word and will intermix strategies (phonetic, visual and rule) in word construction.

One other discernable pattern is that poor spellers consistently omit a sounded letter from all positions in a word which would indicate that either they are trying to reproduce a word by other means than phonics or that even the phonic strategy that they use is not reliable to the phonetic reproduction of a word. Average spellers display the same correlations however they are lower in comparison.

Table Six

Correlation of Error Types with the Beginning, Middle and End of
a Word by Grade Level for Good Spellers

	Beginning			Middle			End		
Position	2-4	5/6	7/8	2-4	5/6	7/8	2-4	5/6	7/8
Reversal				.59**	.37*				
Ommission									
Sounded Letter			.53**						
Silent Letter		.48*							
Doubled									
Vowel									
Consonant						.31*			
Failed Double									
Vowel									
Consonant				.75**		.37*			
Addition									
Vowel									
Consonant									
Syllable									
Substitution									
Phonetic									
Vowel			.31*		.38*				.50**
Consonant	.51**					.48**	.49*	.49*	.37*
Syllable				.41*			.50*		.48**
Non phonetic									
Vowel									
Consonant				.46*			.77***		

Note * p < .05   ** p < .01

Table Six (cont'd)

Correlation of Error Types with the Beginning, Middle and End of
a Word by Grade Level for Average Spellers

	Position								
	Beginning			Middle			End		
	2-4	5/6	7/8	2-4	5/6	7/8	2-4	5/6	7/8
Reversal			.35*			.38**	.60**	.35**	
Ommission									
Sounded Letter		.29**	.42**		.28**	.62**	.31**	.38**	
Silent Letter		.36**			.39**		.29**	.36**	
Doubled									
Vowel									
Consonant		.44**	.31**		.50**	.44**	.51**	.32**	
Failed Double									
Vowel				.75	.31				
Consonant									
Addition									
Vowel		.48**	.30**		.33**				
Consonant		.31**							
Syllable									
Substitution									
Phonetic									
Vowel		.36**			.27*	.21**		.34**	
Consonant	.50**	.36**			.32**	.35**	.49*	.49**	
Syllable				.41*		.38**	.50*		
Non phonetic									
Vowel									
Consonant		.35**		.46*			.77**	.26*	

Note * p < .05 ** p < .01

Table Six (cont'd)

Correlation of Error Types with the Beginning, Middle and End of a Word by Grade Level for Poor Spellers

	Position								
	Beginning			Middle			End		
	2-4	5/6	7/8	2-4	5/6	7/8	2-4	5/6	7/8
Reversal	.73**		.45*				.34**		
Ommission									
Sounded Letter		.59**	.84**	.44**	.43*	.96**	.28*	.65**	.79**
Silent Letter				.25**	.51*		.31**		
Doubled									
Vowel									
Consonant	.79**						.31**		
Failed Double									
Vowel									
Consonant				.26**		.56*			
Addition									
Vowel	.41**			.29*			.26*		
Consonant	.49**			.25*			.24*		
Syllable									
Substitution									
Phonetic									
Vowel					.56**				
Consonant	.64**						.24*		
Syllable						.51**			.45**
Non phonetic									
Vowel									
Consonant									

Note * $p < .05$ ** $p < .01$

Table Six for average spellers contains a number of correlations worth noting. One, the failure to double the vowel is strongest for grades two to four in the middle position and moderately correlated for grades five and six, while doubling the consonant is consistent for grades five to eight for all three positions. The point is that chidren do learn the rule for doubling the consonant however may overextend its use whenever they run into a consonant they are not sure of. In this manner they demonstrate that they can internalize a rule and know that words may carry doubled consonants but have not fully progressed to the point of taking into account when this rule should be applied. A second point worth noting is that there are a number of significant although low to moderate correlations for a number of error types in this table. In contrast to good and poor spellers where patterns and correlations are easier to identify this may represent the fact that average spellers use a number of different strategies as well, but in contrast to good spellers are not as proficient in knowing when and where they can be most effectively applied. Good and average spellers have far more significant correlations for phonetic substitutions than poor spellers who add extraneous information in the earlier grades (vowels, consonants) and continue to omit sounded letters as mentioned previously.

Discussion

This research suggests a number of tentative statements about the efficacy of error analysis and children's continuing acquisition of spelling ability. These statements are limited by some of the problems concerning data analysis and the fact that the division of ability was conducted post hoc.

The twofold purpose of this research was to assess the efficacy of error analysis using a large sample as a means of understanding children's difficulties with spelling. Secondly to see how certain error types are affected by grade level and time. The discussion starts with a review of some of the problems of error analysis. In using error analysis on a large sample the fact that a large number of zeros occur which tend to minimize the means and grossly inflates the standard deviations confuses the results one may get and makes it difficult to assess relationships or differences. In a number of ways this limits the possible analyses that can take place. It would have been interesting to see if those who make errors of a certain type also make errors of another. For example, do children make mostly phonetic errors, or mostly non phonetic errors or a combination of both types. Because error types had to be selected that were greater than zero, the sample was in effect chopped up so that

statistical procedures such as correlational analysis could not be performed.

Other factors such as the easy violation of assumptions because of the nature of the data makes inference a problematical area. One could assume normalcy every time by using large sample sizes but this practice will eventually increase the number of false positives and negatives. In addition it makes the whole idea of using inferential statistics and sampling theory redundant in that large equal sample sizes have to be obtained each time one wishes to test a particular hypothesis. These could be said to be the "technological" problems that interfere with error analysis taking its hold on a major scale. As mentioned earlier by Blair (1981) anyone familiar with educational data often sees data that could be described as far from normally distributed.

Although these "technological problems" do exist and should not be ignored these results have supported the use of error analysis as a viable tool in understanding the breakdowns in the acquisition of spelling which on an idiographic level can help in planning remediation of a child's spelling difficulties. Conducting an error analysis on such a large scale has demonstrated that certain error types do occur with children at different grade levels but are low in absolute number. Other error

types do increase by grade level, however increase more for poor spellers than average or good spellers. This points to the fact than error analysis can be utilized not only in making a qualitative assessment but a quantitative comparison between children for each grade level.

In reviewing the second major purpose of the research, assessing the effects of time, grade level, sex and ability on individual error types the biggest differences in absolute terms are attributable to ability rather than grade level or time although a number of those differences are significant by $p < .05$. The fact that an effect was not found for sex on spelling error types is consistent with earlier research by Finucci, Isaacs, Whitehouse and Childs (1983).

When time was considered as a factor, very few error types demonstrated any real change with the exception of phonetic consonant substitution for grades two to four. Phonetic vowel substitutions show a slight rise for grades two to four, but represent a greater difference between grade levels than across time. When ability was taken into account a number of error types again demonstrated a rather flat effect across grade and ability levels except for phonetic and non phonetic vowel and consonant substitutions. Some error types such as failing to double the consonant and vowel do show a difference that appears

to increase and hold steady by grade five.

While it is not a great revelation that poor spellers
will have a larger number of errors, the error types that
they have trouble with do help indicate where the breakdown
took place. Average spellers and to a greater extent good
spellers are able to draw upon different strategies and
features of a word in order to correctly spell that word.
Poor spellers attempted to produce phonetically
unpredictable words using a phonetic strategy, and this
points to the importance of visual memory for retaining
correct spellings of phonetically unpredictable words. In
addition it suggests that poor spellers have not made the
progression beyond a transitional to a correct stage of
spelling. While there may be some adherence to orthography
they do not progress beyond the surface sound features of
words that they are attempting to spell. In a sense they
are stuck.

A child should be instructed in developing
alternative strategies in order to increase the number of
correctly spelled words. This suggests that research should
be conducted to see if children who are limited in their
use of strategies can be taught to use alternative
strategies. This will be especially important for poor
spellers. In fact a number of authors have suggested that
in spelling as well as reading more experienced spellers

switch from a phonetic encoding strategy in spelling unfamiliar words to a stratey based on analogy with words they have retained in visual memory (Marsh, Friedman, Welch & Desberg, 1980). This was observed in the data where there were peaks by grades five and six for non phonetic vowel and consonant substitutions and where phonetic vowel substitutions increased from grades two to eight.

These results demonstrate that certain error patterns are normal in children's acquisition of spelling ability, however if they go above a certain number they can indicate a breakdown in spelling ability. Beyond possessing a good auditory and visual memory or even knowledge of a set of rules that guide spelling one further development is important. A child has to know how and when to apply each as a good knowledge of each would not necessarily guarantee spelling success. Morris, Nelson and Perney (1986) have previously discovered that poor spellers are lacking in knowledge regarding rules that they believe "underlies the ability to learn new spelling words". Although this research does show that there is a statistically significant difference in the number of rule related error types that a child makes, the fact that there is not a large absolute difference would suggest that it may not be that they are necessarily lacking in these rules but knowing when to apply them.

Developments in the use of rules and strategies associated with visual memory are important, however they are generally under the control of the language a child speaks. If spelling was truly a sound symbol relationship, poor spellers would be more accurate spellers because they persist in using the sound-symbol strategy to the neglect of other strategies. This has to be qualified as it was discovered that a purely phonological strategy is not entirely effective and does not necessarily guarantee even phonetically correct spellings since poor spellers consistently omit sounded letters from the words they are spelling while continuing to use phonetic substitutions.

Waters, Bruck and Malus-Abramowitz (1988) suspect that in spelling, morphological information appears rather late in development (by adolescence). Due to increased exposure children will acquire a complex vocabulary, learning orthographic patterns and generalizations about the relationships between spelling, meaning and phonology. Because there was a lack of any definable error patterns this development may occur earlier (middle childhood, preadolescence) for good spellers and not at all for poor spellers.

The exclusive use of an auditory strategy is consistent with the types of errors made by good, average and poor spellers when one views the correlations for

error types and where they take place in a word. The phonetic consonant substitution occurs for good, average and poor spellers at the beginning of a word and differs only in the strength of the correlation. The fact that other error types which reflect on rule and visual strategies also occur for poor spellers suggests that they are having difficulty in knowing how to begin constructing a word and points to the lack of any definable strategy rather than the predominance of one. This indirectly confirms research by Barron (1981) (in Anderson, 1985) who found that poor readers often use a limited number of strategies and often stick with a phonological strategy in spelling. It has been found also that older students and adults who are poor spellers are limited to using phonetic stragies (Anderson, 1985). Beers, Beers and Grant (1977) have found that although children can use advanced strategies with words that they are familiar with they will use a primitive strategy, (most likely auditory) when faced with words they are unfamiliar with. This could help to explain the higher number of phonetic errors found in comparison to other types of errors, however does not account for the greater prominence of non phonetic vowel and consonant errors in poor spellers. The fact that poor spellers also made a significant number of non phonetic vowel and consonant errors would suggest that in spelling new words there may be times that they will abandon a

phonetic strategy in favour of reproducing a word as to how they think it should look requiring the use of visual memory. This does however suggest one further problem. Because the words were dictated and given the fact that they would have abandoned a phonetic strategy, if they had pronounced the word as they had written it they would have realized that how it looks and sounds is not identical. In this way they are also lacking an important aspect of feedback that would have at least resulted in phonetically accurate words.

Neither of the theoretical positions outlined earlier is totally rejected or supported. In fact, both are important in understanding the acquisition of spelling ability and should not necessarily be viewed as diametrically opposed. Gerber and Hall (1987) point out that in order to understand how children acquire spelling ability models may need to be constructed along algorithmic lines. This would include many of the fundamental tenants of research conducted by the developmental and information processing schools of thought. While a number of propositions of information processing theorists can be said to occur at the automatic level of processing, higher cognitive functions can be said to be equally important and suggest a top down approach not only in acquisition but for remediation. Simple attention to stimulus features does not necessarily guarantee success in spelling and even a

good auditory or visual memory for predictable and unpredictable letter-sound combinations is necessary but not sufficient. The ability to differentiate and decide upon the most appropriate strategy or to draw upon a set of rules knowing when and how to apply them becomes increasingly important and should be considered in areas of curriculum development and research. Some researchers have focused on this component while others have focused on one component of this by considering what strategy children are intentionally using when given the opportunity to rewrite different words. However, higher cognitive functioning can also be a necessary but not sufficient development in spelling since attention to stimulus features will continue to be necessary if children are to spell correctly. Children who are competent in other language processes (reading) which also demand higher cognitive functioning have been found to make significant numbers of spelling errors (Frith, 1980). It is safe to assume that if a child's auditory and visual memory are average to good in their earlier years that they will continue to be so in the later years and that strategy and cognitive sophistication help a child achieve his/her potential with the information processing abilities they have. Even when a child reaches a correct stage of spelling it is recognized that correct means correct for that child at that particular grade. Gentry (1982) has

stated that the major cognitive changes necessary for competency in spelling are probably acquired by the end of the transtitional stage of spelling. Formal instruction helps to extend existing strategies while it is equally important that continued exposure to writing experiences are also important. It can be recognized that spelling as Shlagal (1986 has stated previously becomes a complex cognitive and linguistic phenomenom.

In conclusion, there is the question of what this research contributes to the body of literature available on spelling and error analysis. This research underscores the fact that although certain attributes such as an adequate to good auditory and visual memory and knowledge of rules govering word spellings are important, higher cognitive abilities involving the use of reasoning regarding the use of any one particular strategy is an important development for continued success in spelling. This has implications for both error analysis and spelling instruction. Error analysis will have greater utility in taking into account, not only individual error types but overall strategies associated with clusters of error types. In spelling instruction, children will experience greater success if instruction goes beyond the emphasis on simple reproduction of words and takes into account the transitions children will go through in learning to spell. These can be viewed as opportunities to introduce and

expand on different strategies that are available to the student in helping them to spell.

The acquisition of spelling in this paper has been based on the use of word lists which to a certain extent could be artificial in that it is not very often that children or adults are expected to produce word lists with the exception of weekly spelling quizzes. It will be important that this work is confirmed or refuted by also analyzing sentences and written compositions. It is these two latter conditions that make up the bulk of a child's experience with written language and put a greater strain on his ability to spell. For the meantime this research does provide a basis for future research regarding these latter conditions.

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APPENDIX A

Test Kit Description

Manual for Administration

Test Kit Description

The test kit is designed for ease of administration. Inside the kit there is one manual containing a description of the study and instructions for administration of the tasks. In addition to the manual there are a number of booklets for the students. Each student receives one booklet with a slip of paper on the back of the booklet. Have the student write their name on the slip of paper. This will be their booklet for the duration of the study.

Manual for Administration

Contents

The Study

Instructions for Administration

Material for Administration

The Study

To the Teacher,

I would like to take this opportunity in advance to thank you and your students for your participation in this study.

This research study is designed to investigate the consistency of spelling errors that children make over time, grades and age. This type of study can have practical benefits for the teacher who has to deal with academic errors on a daily basis. If errors types are found to be consistent across age or grade this can benefit the teacher for purposes of planning and curriculum.

This research study is designed to obtain the greatest amount of data from students with the least amount of intrusiveness on the teaching schedule of the classroom. It is important for purposes of the research that the teacher adhere as closely as possible to the instructions for administration. While the instructions are designed with the classroom situation in mind, any alterations could have serious repercussions on the outcome of the study. If problems

do arise please feel free to call me. Phone numbers where I can be reached are listed below. However I will be contacting you periodically to find out how it is going. If for any reason you are away the study can still be carried out by your replacement by merely following the instructions.

Phone Numbers

Home: 622-0278

Lakehead University (Psychology Graduate Lounge): 343-8476

Instructions for Administration

This study is designed to last for thirteen weeks. There is a word list presented every three weeks to the students. All that is required is that you hand out the booklets at the beginning of each task. Turn to the manual and administer the appropriate task from the schedule of administration. You will find under each task that there is one set of instructions to be repeated five times. It is recommended that after you administer the task you cross out the task from the schedule and circle the task number completed in order to keep track of where you are. For example after you have dictated the 1st word list you would cross out Week One from the schedule and circle 1 from the instructions for word list. The manual provides instructions for each task including the procedure for recording age, grade and sex. Once the task is completed have the children carefully separate the page they have completed from the rest of the booklet and hand both in separately. The individual pages will be collected at the end of the week. The booklets can be returned to the test kit box. Once the children have completed the fifth word list have them remove the slip of paper with their name on it and discard it. This will help to guarantee

anonymity.

The study should be introduced to the students by reading the "Study Introduction" section.

It is essential that the children have properly filled out the information on the top of the papers. Regardless of the age please have them print all necessary information and only upon your instructions. They can print or write that task as they please but they should try to be as neat as possible as their responses have to be read and rerecorded.

Caution: Please do not refer to any of the tasks as a test, quiz or exam.

Schedule for Administration

Week One: Dictated Word List

Week Four: Dictated Word List

Week Seven: Dictated Word List

Week Ten: Dictated Word List

Week Thirteen: Dictated Word List

Study Introduction

We have been asked by Lakehead University to participate in a study on words that is being conducted. Over the next thirteen weeks there will be a number of small tasks that we will do. These are not tasks that require any kind of preparation or practice. You will not be marked on them and the will be kept confidential. (For younger children explain that confidential means that no one will know the results except the person doing the study.)

At the beginning of the week we will do one small task. I will read the instructions to you on what to do for each task. These tasks will not take too long. After each task is finished I will ask you to hand in your papers. Each of you will be given a booklet. On the back of each booklet you will find a slip of paper. Print your name on the slip of paper. This will be your booklet for the entire study. After we have finished one task you will take the page you have worked on and carefully separate it from the rest of the booklet. You will then hand in your work and the booklet. Are their any questions? (Any questions that are asked by the pupil can be answered by reference to the above instructions or by what was gone over during the initial briefing session.) Lets begin with task one.

DICTATED WORD LIST

READ THE FOLLOWING INSTRUCTIONS:

At the top of the paper print your age beside the space marked age, grade beside the space marked grade.Circle either M for male or F for female. Now circle the letters W.L. and the number 1 2 3 4 5

Now write or print the words that I will say. I will say the word, use it in a sentence and say the word again. If you do not know the word, that is okay. Try and spell it the best you can but print or write the word. Be neat and work as quickly as you can.

Lets start with the first word.

NOTE: DO NOT OFFER ANY HELP IN SPELLING ANY OF THE WORDS.

DICTATED WORD LISTS: GRADE TWO - FOUR /LIST ONE®

1. bite - Have a bite of the apple. - bite

2. and - Bill and Judy went home. - and

3. arrow - That arrow flew far. - arrow

4. almost - We almost did it. - almost

5. dark - That is a dark colour. - colour

6. ankle - I turned my ankle today. - ankle

7. bead - The bead fell off my necklace. - bead

8. bush - The dog is behind the bush. - bush

9. flies - There are a lot of flies in here. - flies

10. bare - The cupboard was bare. - bare

11. bags - Please carry these bags. - bags

12. bottom - The paper is in the bottom drawer. - bottom

13. boxes - Pile these boxes over there. - boxes

14. bridge - This is a long bridge. - bridge

15. asleep - They are asleep now. - asleep

16. also - I also like apples. - also

17. mark - She left her mark. - mark

18. ate - I ate supper. - ate

19. creep - Lets creep over to the fridge. - creep

20. buzz - The clock is starting to buzz. - buzz

21. bull - The bull is in the field. - bull

22. four - He has four trucks. - four

23. pail - The pail is on the beach. - pail

24. bump - He has a bump on his head. - bump

DICTATED WORD LISTS: GRADE TWO - FOUR /LIST TWO®

1. fasten - Fasten your seat belt. - fasten

2. farther - The house is not much farther. - farther

3. bigger - She is bigger than you. - bigger

4. later - I'll see you later. - later

5. plank - He has to walk the plank. - plank

6. born - The puppies were born last night. - born

7. cotton - This shirt is made of cotton. - cotton

8. cave - The bear lives in that cave. - cave

9. gain - I can gain five pounds. - gain

10. here - Come over here. - here

11. did - They did well. - did

12. him - Did you see him. - him

13. breast - Have a breast of chicken. - breast

14. hatch - Did the eggs hatch. - hatch

15. cutting - He is cutting wood. - cutting

16. lose - Did you lose your bike? - lose

17. rent - We paid the rent. - rent

18. giant - The story is about a giant. - giant

19. caught - She caught the ball. - caught

20. fishing - They went fishing. - fishing

21. laughing - They are laughing at the joke. - laughing

22. buy - We will buy some paint. - paint

23. flew - The bird flew south. - flew

24. am - I am here. - am

DICTATED WORD LISTS: GRADES TWO - FOUR /LIST THREE®

1. comes - Here she comes. - here

2. bound - I bound and tied the package. - bound

3. broom - Get the broom please. - broom

4. melon - I would like some melon please. - melon

5. so - He is so nice. - so

6. drum - I bought a new drum. - drum

7. dollars - I have six dollars. - dollars

8. lace - This is a lace table cloth. - lace

9. looked - I looked for him. - looked

10. deer - Did you see the deer? - deer

11. he - He is very smart. - he

12. jumping - The boys are jumping. - jumping

13. cookies - These cookies are for you. - cookies

14. march - We will march to the music. - march

15. dropped - I dropped my pencil. - dropped

16. until - I can stay until supper. - until

17. books - Here are your books. - books

18. girl - She is a very busy girl. - girl

19. hall - The coat is in the hall. - hall

20. mice - They have mice in their closet. - mice

21. paw - The dog hurt its paw. - paw

22. eight - I have eight candies. - candies

23. her - I saw her over there. - her

24. rich - She is very rich. - rich

DICTATED WORD LISTS: GRADES TWO - FOUR /LIST FOUR®

1. match - Can you match the pictures? - match

2. crack - This sidewalk has a crack in it. - crack

3. glass - I need a glass of water - glass

4. welcome - Welcome to our house. - welcome

5. coming - Are you coming to the store? - coming

6. field - He is in the field. - field

7. ton - It weighs a ton. - ton

8. often - I often come here. - often

9. though - Though I don't like vegetables, I will eat them. - though

10. bake - We can bake a cake. - bake

11. hoe - I can hoe the weeds. - hoe

12. lamp - Turn on the lamp please. - lamp

13. alone - He is alone. - alone

14. starve - Eat or else you will starve. - starve

15. hammer - I have to hammer this nail. - hammer

16. lily - I picked a lily from the garden. - lily

17. hop - Hop over the log. - hop

18. nickel - Five pennies equals a nickel. - nickel

19. obey - Obey the stop sign. - obey

20. pony - See the pony over there. - poney

21. babies - They have three babies. - babies

22. meat - I like meat pies. - meat

23. hot - It is hot in here. - hot

24. room - There is room for you. - room

DICTATED WORD LISTS: GRADES TWO - FOUR /LIST FIVE®

1. awhile - Wait awhile over here. - awhile

2. street - She lives on that street. - street

3. begged - He begged for money. - begged

4. hoped - I hoped he could stay. - hoped

5. an - I will have an apple for desert. - an

6. patch - I will patch the hole for you. - patch

7. cellar - They are in the cellar. - cellar

8. recite - She will recite a poem. - recite

9. parties - I like parties at Christmas. - parties

10. rake - He will rake the leaves. - rake

11. let - Let them do the work. - them

12. seem - Does it seem new to you? - seem

13. cracker - I will have a cracker with cheese. - cracker

14. studying - She is studying for her test. - studying

15. bonnet - She has a new bonnet.- bonnet

16. already - I already knew that. - already

17. grab - Grab the door handle please. - grab

18. piece - Have a piece of cake. - piece

19. heap - The clothes are in a heap. - heap

20. slice - Have a slice of pie. - slice

21. aim - Her aim is good. - aim

22. pear - A pear is good to eat. - pear

23. red - Their house is red. - red

24. bedroom - He is asleep in his bedroom. - bedroom

DICTATED WORD LIST: GRADES FIVE - SIX /LIST ONE®

1. basement - The bike is in the basement. - basement

2. barley - Barley is a type of grain. - barley

3. address - I have his address. - address

4. already - I have already seen them. - already

5. fever - He has a fever. - fever

6. angel - This is an angel food cake. - angel

7. creek - We can play by the creek. - creek

8. advice - That is good advice. - advice

9. accept - I accept your offer. - accept

10. birth - They announced the birth of their baby. - birth

11. hoe - You can hoe the garden. - hoe

12. bedroom - Your clothes are in your bedroom. - bedroom

13. beast - A donkey is called a beast of burden. - beast

14. capture - They will play capture the flag. - capture

15. arrest - The police will arrest him. - arrest

16. chose - I chose to play golf today. - chose

17. fled - They fled on foot. - fled

18. chief - He is the chief of police. - chief

19. beef - I'll have beef today. - beef

20. base - He stole third base. - base

21. compare - Let's compare notes. - compare

22. deer - A deer is a cousin to the elk. - deer

23. reward - They offered a reward. - reward

24. improved - I have improved my tennis game. - improved

DICTATED WORD LISTS: GRADES FIVE - SIX /LIST TWO®

1. cleaning - They are cleaning the rugs. - cleaning

2. governor - He is the governor. - governor

3. account - I started a bank account. - account

4. chosen - She was chosen to play hockey. - chosen

5. chest - I have a chest cold. - chest

6. candle - The candle is burnt out. - candle

7. celebrate - Let's celebrate your birthday. - celebrate

8. advice - That is good advice. - advice

9. mere - It is a mere distance from here. - mere

10. eight - I have eight dollars. - eight

11. stump - That tree stump should be removed. - stump

12. kindergarten - She starts kindergarten this morning. - kindergarten

13. wrist - I hurt my wrist. - wrist

14. carrying - He is carrying the books. - carrying

15. appear - She will appear over there. - appear

16. handful - Have a handful of peanuts. - handful

17. export - Canada will export lumber to Japan. - export

18. freight - That is a freight train. - freight

19. harbor - Do not harbor a grudge. - harbor

20. crash - Did you see the train crash. - crash

21. parties - There are a lot of parties during Christmas. - parties

22. fare - The taxi fare is five dollars. - fare

23. flew - They flew to Toronto this morning. - flew

24. themselves - The can look after themselves. - themselves

DICTATED WORD LISTS: GRADES FIVE - SIX /LIST THREE®

1. earnest - He is waiting in earnest. - earnest

2. forward - He plays forward for the Twins. - forward

3. approve - I approve of your decision. - approve

4. helpful - He is helpful around the house. - helpful

5. forty - She is forty years old. - forty

6. giant - There is a giant sale on Saturday. - giant

7. beggar - He is a beggar for money. - beggar

8. decided - I decided not to go. - decided

9. aid - They need first aid. - aid

10. fought - He fought in World War Two. - fought

11. tip - Thanks for the stock tip. - tip

12. thinking - He is thinking about the story. - thinking

13. hope - I hope they come today. - hope

14. government - Canada has a democratic government. - government

15. allow - I'll allow you to go this time. - allow

16. hoped - He had hoped for a new bike. - hoped

17. tar - This road has fresh tar. - tar

18. deceive - They will deceive you. - deceive

19. destroy - I had to destroy the box. - destroy

20. blaze - They will blaze a new trail. - blaze

21. claim - I can claim the book at the lost and found. - claim

22. due - They are due at anytime. - due

23. cost - The baseball will cost too much. - cost

24. jumping - She is jumping on the trampoline. - jumping

DICTATED WORD LIST: GRADES FIVE - SIX /LIST FOUR®

1. knitting - They are knitting sweaters. - knitting

2. dodge- Can you dodge this ball. - dodge

3. canned - They canned peaches last summer. - canned

4. proper - That was the proper thing to do. - proper

5. using - I am using red paint this time. - using

6. hose - Get the garden hose please. - hose

7. honor - It was an honor to play for them. - honor

8. deuce - The word deuce means two. - deuce

9. aim - Her aim is good. - aim

10. groan - That was a loud groan. - groan

11. pump - The water pump is broken. - pump

12. import - That country will import cotton. - import

13. bruise - That's quite a bruise on his arm. - bruise

14. pumpkin - Have some pumpkin pie. - pumpkin

15. beginning - They are beginning to write the story. - beginning

16. dining - We are dining at eight. - dining

17. closing - It will be closing time soon. - closing

18. niece - My niece is here for a visit. - niece

19. conductor - The conductor took our tickets. - conductor

20. practice - I have to practice tonight. - practice

21. babies - They have three babies. - babies

22. herd - He has a large herd of cattle. - herd

23. slip - Don't slip on the ice. - slip

24. gross - They bought three gross of pencils. - gross

DICTATED WORD LISTS: GRADES FIVE - SIX /LIST FIVE®

1. buying - I am buying that car. - buying

2. quarter - I found a quarter today. - quarter

3. finally - We are finally finished this model. - finally

4. fearful - He is fearful of snakes. - fearful

5. ninth - That is the ninth customer today. - ninth

6. puzzle - I have a new picture puzzle. - puzzle

7. earliest - This is the earliest I can make it. - earliest

8. prize - They won first prize. - prize

9. underwear - He bought new underwear. - underwear

10. loan - I paid off my bank loan. - loan

11. stir - Stir the soup before you drink it. - stir

12. attack - They attack at dawn. - attack

13. failed - I failed my test. - failed

14. stitch - This sock could use a stitch.- stitch

15. bluff - Can you bluff your way out of this. - bluff

16. lining - The lining is gone from the coat. - lining.

17. giving - He is giving up. giving

18. shield - A knight uses a shield. - shield

19. fragrant - This flower has a fragrant smell. - fragrant

20. reduce - I can reduce the temperature. - reduce

21. phone - I paid the phone bill. - paid

22. loss - That was a great loss today. - loss

23. step - I will step outside for a moment. - step

24. lamp - The lamp is burnt out. - lamp

DICTATED WORD LIST: GRADES SEVEN - EIGHT /LIST ONE®

1. completely - I am completely finished. - completely

2. adjust - Adjust the volume please. - adjust

3. accommodate - This room can accommodate two. - accommodate

4. administration - I was at the administration. - administration

5. construction - There is new construction going on . - construction

6. angle - Reverse the angle of the picture. - angle

7. ballot - Have you filled out your ballot. - ballot

8. responses - Those were good responses. - responses

9. accepted - I accepted the job. - accepted

10. pause - Let's pause for a minute. - pause

11. stump - That tree stump should be removed. - stump

12. congradulate - Did you congradulate him. - congradulate

13. condemn - He will condemn the building. - condemn

14. boundary - Don't step out of the boundary. - boundary

15. afford - I cannot afford that record. - afford

16. amendment - They have passed a new amendment. - amendment

17. complexion - Her skin has a fair complexion. - complexion

18. chapel - I will meet you in the chapel. - chapel

19. accordance - In accordance with the law. - accordance

20. selected - He has been selected for that job. - selected

21. companies - They do business with those companies. - companies

22. principle - He was the principle witness. - principle

23. reward - He paid a reward for that. - reward

24. gratitude - They expressed their gratitude. - gratitude

DICTATED WORD LIST: GRADES SEVEN - EIGHT /LIST TWO®

1. acquire - I will acquire the deed this afternoon. acquire

2. breadth - It spans the entire breadth. - breadth

3. addressed - I addressed those letters. - addressed

4. control - I can control the water level. - control

5. completed - I have completed my work. - completed

6. Christian - He belongs to a Christian group. - Christian

7. basis - I did it on this basis. - basis

8. type - I can type your letter for you. - type

9. grateful - He was grateful for the present. - grateful

10. choir - He listened to the choir. - choir

11. cost - This will cost too much. - cost

12. attack - I will attack the problem. - attack

13. affectionately - He said that affectionately. - affectionately

14. badge - He received a new badge. - badge

15. affair - There was a new affair today. - affair

16. compel - I did not compel him to speak. - compel

18. exist - He does not exist. - exist

19. guardian - I am her guardian. - guardian

20. compliment - That was a nice compliment. - compliment

21. absence - I said that in his absence. - absence

22. hereafter - Do you believe in a hereafter? - hereafter

23. clause - Scratch the clause from the contract. - clause

24. flew - They flew home. - flew

DICTATED WORD LISTS: GRADES SEVEN - EIGHT /LIST THREE®

1. gross - They bought a gross of pencils today. - gross

2. approach - Try a new approach next time. - approach

3. delicious - This cake is delicious. - delicious

4. affection - He said that with great affection. - affection

5. arise - They will arise together. - arise

6. regret - I regret they cannot make it. - regret

7. label - Read the label before you buy. - label

8. affect - This could affect my grades. - affect

9. anticipate - I did not anticipate that. - anticipate

10. duties - I have assigned new duties. - duties

11. coarse - This cloth feels coarse. - coarse

12. Sabbath - Tomorrow is the Sabbath. - Sabbath

13. import - I had to import these books. - import

14. autumn - I like autumn best of all. - autumn

15. official - His word is official. - official

16. connect - I will connect those wires. - connect

17. arouse - Did you arose him from his sleep? - arouse

18. owing - He is always owing money. - owing

19. receiving - He is receiving a present. - receiving

20. celebration - Let's have a celebration. - celebration

21. underwear - He just bought new underwear. - underwear

22. concern - I have a concern. - concern

23. council - City council meets tonight. - council

24. stir - Stir the soup please. - stir

DICTATED WORD LIST: GRADES SEVEN - EIGHT /LIST FOUR®

1. arrangement - They worked on a new arrangement. - arrangement

2. substitute -They need a substitute for the team. - substitute

3. correct - That is the correct answer. - correct

4. limited - It has a limited release. - limited

5. pleasing - That is pleasing to the eye. - pleasing

6. ruffle - That shirt has a ruffle. - ruffle

7. benefit - They are holding a benefit supper. - benefit

8. concert - Let's go to the concert tonight. - concert

9. compare - We can compare notes. - compare

10. capitol - Toronto is the capitol of Ontario. - capitol

11. pump - The pump is broken. - pump

12. thinking - He is thinking about the story. - thinking

13. clothe - Please feed and clothe him. - clothe

14. quantity - What quantity of material is needed? - quantity

15. commission - I get paid on a commission basis. - commission

16. occasion - What occasion are you celebrating? - occasion

17. refer - I refer to that book over there. - refer

18. seize - He will seize the opportunity. - seize

19. calendar - They received a calendar in the mail. - calendar

20. hence - Hence, you owe me some money. - hence

21. niece - My niece is coming to visit. - niece

22. border - They slipped across the border. - border

23. slip - Don't let the secret slip. - slip

24. themselves - They aren't themselves today. - themselves

DICTATED WORD LIST: GRADES SEVEN - EIGHT /LIST FIVE®

1. cocoa - I had a cup of hot cocoa. - cocoa

2. temptation - Those donuts are a temptation. - temptation

3. communicate - Did they communicate that to you? - communicate

4. rebel - He is quite the rebel. - rebel

5. regard - I have a lot of regard for her. - regard

6. siege - They laid siege to the fort. - siege

7. applied - I have applied for that job. - applied

8. extension - Try them on the next extension. - extension

9. claim - I can claim this as a deduction. - claim

10. desert - There is cake for desert. - desert

11. fell - She fell off the swing. - fell

12. kindergarten - She was enrolled in kindergarten. - kindergarten

13. courtesy - This is a courtesy call. - courtesy

14. appropriate - It was appropriate to say that. - appropriate

15. disappoint - He does not like to disappoint you. - disappoint

16. remit - I will remit the payment. - remit

17. remembrance - It is Remembrance day. - remembrance

18. villain - He is the villain of the story. - villain

19. approval - She did it with your approval. - approval

20. discussed - I have discussed the plans with her. - discussed

21. phone - You can phone your friend. - phone

22. formerly - They are formerly from Windsor. - formerly

23. hoe - It is time to hoe the garden. - garden

24. line - Draw a line from here to there. - line

APPENDIX <u>B</u>

Spelling Error Classification System

Error Scoring Form

Spelling Error Analysis Criteria

In this error analysis system there are 21 different categories. Most if not all errors can be covered under this system. There are some general rules for overall analysis as well as specific criteria for each category.

1. If the error in the entire word cannot be explained by three categories the word is considered unrecognizable/incomplete.

2. If a word contains both phonetic and nonphonetic errors they are placed within there respective categories.

3. If a word is unclassifiable or you are not really sure do not analyze it.

4. Enter total number of words that have errors beside #___ , not the total number of errors.

Categories

Transposition/Reversal:
When 2 letters are reversed in sequence within the word where if reversed again they would be in the correct sequence. i.e. paece for peace

Omission of a sounded letter:
When a letter that is sounded within the pronounciation of the word is omitted. i.e. gade for grade

- or in the construction of the schwa sound - i.e. rond for round

Omission of a silent letter:

When a letter that is silent in
pronounciaton of the word is omitted. i.e. lac for lace

Ommission of a syllable:

Where there is an ommission of an entire
syllable from a word. i.e. enre for entire

Doubled vowel:

such as beend for bend

Doubled consonant:

such as foott for foot

Failure to double the vowel:

such as sen for seen

Failure to double the consonant:

such as bel for bell

Addition of a syllable:

Where the inclusion of 2 or more
letters creates a syllable within the word that could be
pronounced. i.e. applela for apple

Addition of a consonant:

addition of one consonant letter to a
word. i.e. formn for form

Addition of a vowel:

addition of one vowel to a word.

i.e. ceant for cent

Phonetic vowel substitution:

substitution of a similar sounding

vowel. i.e. melen for melon

Phonetic consonant substitution:

substitution of a similar sounding

consonant. i.e. lase for lace

Phonetic syllable substitution:

such as explanashun for explanation

Phonetic Word substitution:

where a word doesn't contain the correct

visual features of a word but could be pronounced phonetically.

i.e. hol for hall. This error would also be scored if a word contained

two to three phonetic errors.

Non-phonetic vowel substitution:

substitution of a vowel where if

pronounced would not contribute to the correct phonetic

pronunciation of the word. i.e. ipen for open

Non-phonetic consonant substitution:

substitution of a consonant where

if pronounced would not contribute to the correct phonetic

pronunciation of the word. i.e. wottle for bottle

Non-phonetic syllable substitution:

letters combined to form a

syllable but do not add to the correct phonetic pronunciation of

the word. i.e. antil for until

Word Substitution:

where an entire word hs been substituted.

i.e. two for bound or where and error has resulted in a

correctly spelled word. i.e. draped for dropped

Unrecognizable/Incomplete:

where more than 3 errors render

the word as unrecognizable by phonetic pronuciation.

i.e. doles for dollars or the word has not been completed

i.e. con for construction. If the word has only one syllable

missing it would be scored under ommission of a syllable

i.e. construc for construction

Position 1 2 3:

these categories are for further research

purposes and involve indicating where the error occurred,

in the first second or third section of the word.