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In This Issue

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About the Authors

M. Jan Mickler is currently developing a teacher training project that will focus on training teachers to use thinking strategies in their instruction. Dr. Mickler's interest in spelling has resulted in the development of a research-based spelling program consisting of twenty instructional components. See also **Spring/Summer 1987**. Item 3.

C. Glennon Rowell is Associate Dean for Graduate Studies, College of Education, University of Tennessee (Knoxville). Dr. Rowell has taught Language Arts undergraduate and graduate courses for nearly twenty years. Included among the graduate courses is a spelling/mechanics course in written expression. Among his writings are several articles on spelling.

Gail B. Culyer is a free-lance consultant and writer. She received her Ph.D. in Reading/Language Arts at Florida State University.

Robert L. Trammell teaches in the Department of Languages and Linguistics at Florida Atlantic University, Boca Raton, Florida.

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1. From the Editor

Walter B. Barbe

The Editorial Board of the *Spelling Progress Quarterly* has an open-minded policy in the selection of articles that present a variety of approaches to the teaching of spelling, as well as different positions regarding solutions to the problems with English orthography. Thus, not all articles printed in the journal represent the point of view of the Editorial Board or the sponsors. In keeping with this policy, the current issue covers a broad range of subjects, from theoretical models of spelling, to spelling instructional techniques, to preparation of spelling lists, to use of computers in representing spellings of particular sounds through color coding.

It opens with an article by **Jan Mickler**, entitled **"Models of Spelling: Different Views of the Process of Spelling,"** that describes six theoretical models of the spelling process and discusses instructional implications of these models. She points out that these models of the spelling process call for a process orientation in which the learner is using various strategies and a multi-faceted knowledge of the language in spelling, rather than a product orientation in which the emphasis is simply on correct spellings.

C. Glennon Rowell's article, entitled **"The Inductive Teaching of Spelling Patterns and Generalizations: Some Suggested Strategies,"** explains what inductive strategies are and describes three broad variations for using an inductive approach to teaching spelling: the prearranged-data approach, the experiential approach, and the investigatory approach. Rowell stresses the importance of using a variety of inductive strategies, rather than a single one.

In **"Selecting Spelling Words Using a Synthesized Approach,"** **Gail Culyer** discusses the nature of the relationships between reading and spelling and between writing and spelling. She also describes the development of a prototype for creating a basic spelling word list**.**

Robert Trammell describes the development of a color-coding system for the pronunciation of English words to be implemented on an Apple II computer in his article, **"Color Coding Pronunciation with Binemic Phonics."** He explains the coding system and suggests applications of the system to instructional situations.

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2. Models of Spelling: Different Views of the Process of Spelling

M. Jan Mickler

Whether we teachers realize it or not, we use theoretical models that guide us in our selection of teaching techniques. Models are important in that they provide road maps and directions that we (and our students) use to navigate from the beginnings of tasks to their successful completion. Models make it possible to translate an abstract set of ideas into a language that both describes and explains.

Three important models have sparked the historical and persistent debate regarding the teaching of spelling: a phonics approach, an altered orthography approach, or a sight-word approach. Each of these paradigms comprises theoretical constructs and pedagogical techniques as well as a massive body of supportive literature that often inhibits a clear resolution of the issues about how one learns to spell and how best to teach spelling.

The ensuing discussion focuses on six theoretical models and their instructional implications.

Model 1: Process Model (Hanna and Hodges, 1963)

Hanna and Hodges (1963) compared the process of spelling with the functioning of a computer. Both the speller and the computer require mechanisms for the input of data, a scheme for internally organizing data, and a vehicle for generating informational output data. This process is dependent on procedures of bringing order to "seemingly dissimilar events" using a binary, "either-or," process that selects, stores, or interprets linguistic information or commands.

The spelling process consists of three channels: input, which contains biological, psychological, cultural, and linguistic sources; throughput, the learning-to-spell channel, in which spellers tap knowledge from curricula, methodology, and spelling reform programs; and output, in which spelling products are related to physical and psychological behavioral competencies.

Model 2: Information Processing Model (Personke and Yee, 1966, 1971)

Beginning with a "felt need" to spell a word, spellers use any of five complementary channels: memory, kinesthetic detour, checking, proofreading, and detour. The memory channel is long-term memory for learned words, spelling generalizations, and word analysis skills. The kinesthetic detour is used when words have been so thoroughly learned that correct spelling is automatic. The checking channel, which is used before writing a word, is used to refer to external sources for verification. The proofreading channel is like that of the checking channel, but is used to confirm the written product. The detour channel is used when a word has been misspelled. It allows spellers either to use an external source (using a dictionary, asking for help) or to repeat the process.

Model 3: Generate and Test Model (Simon and Simon, 1972; Simon, 1975, 1976)
Simon and Simon used a computer simulation program to represent the task structure of spelling. They defined four routines. One is the Perceived Mode in which spellers either locate the word in long-term memory or, failing to find the word, rehearse the sound pattern and search for relevant sound pattern strings and context. A second is the use of the Generate program. This allows spellers to take the word and perceive a string of corresponding graphic symbols. A third is the Produce program, which provides the motor program for writing the word. A fourth program is the Test program, which allows spellers to check words for accuracy.

Both the Simon and Simon and the Personke and Yee models assume that misspellings occur as a result of a breakdown in the processing stream. According to Marino (1978), "Neither model suggests just what kinds of linguistic information are necessary to locate the required graphemes" (p. 15).

Model 4: Lexical and Non-Lexical Processing Model (Seymour and Porpodas, 1980)

Seymour and Porpodas theorized that the act of spelling is dependent on two operational processing channels, non-lexical and lexical/semantic. Spellers using the non-lexical channel have access to phonemic information that is translated into graphemic representations. Phoneme/articulatory elements and/or pattern recognition clues are stored in this channel. The lexical/semantic channel stores lexical information such as correct word spellings and meanings and is particularly useful when spelling words are considered as "irregular." When writing words, spellers use both channels as an access to a "word specific spelling store" that houses both regularly and irregularly spelled words and that itself provides access to semantic, graphemic, and phonological information necessary for correct spellings.

Model 5: Word Identity Amalgamation Theory (Ehri, 1980)

Ehri chose the term "amalgamation" to denote a process by which an orthographic image—a sequence of letters semantically related to phonological properties of words—is stored in a person's lexical memory. This orthographic information, a function of visual memory, is synthesized with syntactic, semantic and phonological properties that combine to form single units in lexical memory. Spellers who have stored

visual representations of orthographic images use prediction strategies that reflect an awareness of orthographic rules and their constraints. Visual images ensure that all letters are included in spellings, that semantically related words though different in pronunciation, are similarly spelled, and that the correct orthographic pattern is selected when a number of options are available *(pair, hear, dare, prayer. ere, e'er).*

Model 6: Developmental Spelling Model

Unlike the previously discussed models, this model cannot be attributed to one person. Rather, the constructs have been developed from many research investigations since 1965. This discussion provides an overview of research reported by Frith (1980), Hodges (1982), and Hodges and Read (1982).

A central idea in this model (and one found in previously discussed models) is that written language reflects various levels of analysis of spoken language. The American English language is viewed in terms of phonological, orthographic, morphological, syntactic, and semantic regularity. Beginning spellers learn these interrelated linguistic structures through a "trial and error" procedure. With gradual exposure to standard spellings, they begin to discover and use the relationships between words and their underlying concepts.

Knowledge of these relationships begins as preschoolers attempt to associate sounds they know with graphic symbols. Research (Read, 1975) shows that young children make consistent and systematic judgments that reflect a beginning sensitivity to subtle aspects of English phonology. Furthermore, young spellers have shown that they actively search for orthographic generalizations that result in increased standard spellings.

Children learn that English orthography is characteristically structured so that certain letter sequences are highly probable in certain orders and are not permissible in others (Gibson, 1975). Their spelling strategies appear to change as they broaden their understanding of phonological, orthographic, and morphological rules of language (Barnes, 1982).

In contrast with traditional views of spelling, the developmental model categorizes the speller as an active seeker of increasingly sophisticated linguistic strategies. Spelling ability grows, not because spellers learn only the letter sequences of each word, but because spellers assimilate the associations between words and their linguistic characteristics.

Instructional Implications

Prior to the development of these models, a predominant focus of spelling instruction was on products (correct spellings). That is, the selection of words for instruction was based on their frequent occurrence in oral and written language (and/or because of their persistent difficulty). The idea was that children should learn to spell those words that were most needed.

Instead of a products orientation, these models and authorities in spelling call for a process orientation in which the learner is using various strategies and a multifaceted knowledge of the language in spelling. This view of the spelling process indicates several important implications for instruction.

Implication No. 1.

The emphasis on word selection for instruction should be primarily based on the degree to which the words help children discover and use the phonemic, semantic, morphological, and orthographic structures in language. The focus should be on teaching children to spell by developing their sensitivity to these linguistic structures in words, rather than by memorizing the sequence of letters in the words themselves. Further, this knowledge helps children generalize the rule that words with linguistic characteristics similar to a word they know will be spelled similarly.

Implication No. 2

The emphasis in spelling instruction should be on exposing children to the multi-level dimensions of the spelling process. One level is that of surface sound/letter relationships (or for preschoolers, the articulatory/letter relationships). This knowledge is viewed as a foundation for developing increasingly sophisticated spelling strategies. Instruction that focuses, in part, on the phoneme/grapheme linguistic structures helps students generate alternate spellings of an attempted word in order to select the spelling that "looks right."

Another level of linguistic knowledge is called "morphophonemic." This knowledge tells children that many words related by meaning are similarly spelled even though they are pronounced differently. This knowledge is particularly useful when spelling the schwa sound found in unaccented syllables. According to Anderson (1972), the schwa is a major source of difficulty because it can be spelled thirty ways with almost any vowel or vowel digraph. Process theorists, by focusing on deeper structures than surface sound/symbol relationships, have found that a speller's knowledge of semantic relationships of words is an important aid to spelling. For example, Anderson (1982) identified a linguistic pattern in which the pronunciation of a derived word form changes because a corresponding syllable in both words changes from a stressed to an unstressed (schwa) syllable *(inspire/inspiration; oppose/opposition).* The spelling key in this "vowel reduction" pattern, however, is that the letter used for each corresponding syllable remains the same despite the shift in pronunciation.

The usefulness of this strategy is that when spellers are unsure of which vowel letter to select for an unaccented syllable, they can often think of a word in the same word family, examine the letter in the corresponding syllable, and use that letter to spell the troublesome syllable. The implication for instruction is clear. More attention should be given to the structural relationships of these words *(compose/composition; preside/president,* etc.).

Implication No 3

A third implication is that correcting misspellings should be an active, thinking process that focuses on making comparison decisions. Once a speller has misspelled a word, the task becomes a process of comparing the misspelled part of the word with the corresponding part of the correctly spelled word. The question then becomes, "What went wrong?" Among the possibilities are the use of a wrong phoneme/ grapheme relationship, associating a wrong meaning, or failing to use a morphophonemic strategy. Once the speller has determined the nature (and subsequent correction) of the mistake, the chances are reduced that the mistake will be repeated.

To summarize, recent investigations have focused on the strategies used by individuals when attempting to spell, as well as on the structural linguistic' characteristics of oral and written language. An important finding is that active spellers are in a continual process of developing their knowledge of phonological semantic, morphological, and syntactic properties of words. With continued and frequent exposure to oral and written language, spellers devise and refine spelling strategies that permit a large number of words that share similar linguistic characteristics to be similarly spelled.

The use of phoneme/grapheme generalizations is but one spelling strategy. Spellers also have access to orthographic images stored in long-term memory.

These "amalgamations" assist spellers in determining whether their spelling attempts "look right." Further, when spellers are attempting to spell semantically related words with different pronunciations,

stored orthographic letter strings allow the speller to focus on corresponding syllables that give clues to the correct letter.

Teachers can help students develop their knowledge of linguistic characteristics by focusing their attention on the many reasons why words are spelled as they are. For example, it may be that the word is phonetically regular and sound/symbol relationships can be used, or it may be that regularity exists because two semantically related words share a common letter in corresponding syllables.

The emphasis is appropriately focused on the question "What does our language tell us about how to write it down?" These models are but another step in answering that question.

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Spelling Instruction

3. The Inductive Teaching of Spelling Patterns and Generalizations: Some Suggested Strategies

C. Glennon Rowell

A review of the literature on how to teach spelling patterns and generalizations reveals that inductive strategies are favored more often than are deductive strategies (Burns and Braman 1983; Hanna et al., 1971; Mickler, 1985). What is an inductive strategy for teaching spelling patterns and generalizations? In simplest terms it is the provision of instruction whereby the learner is led to see a pattern or generalization as opposed to instruction in which the learner is told a pattern or generalization. (This latter is generally called a deductive technique.) The inductive strategy requires two conditions:
(1) specific information or data must be available in sufficient quantity to enable students to discover the pattern/ generalization being taught, and
(2) the learner must be motivated to examine the data critically.

Several reasons have been advanced for the effectiveness of the inductive process. Donoghue (1971) states that permanence of learning results when students discover patterns through planned word analysis. Mickler (1985) concludes that "the inductive method appears to be particularly valuable in producing long-term retention and a transfer to unknown words" (p. 79). Hanna and others (1971) point to the fact that oral language is learned inductively and that spelling patterns should be learned in a similar manner. Others have indicated that the inductive strategy promotes more thinking than does the deductive strategy and the inductive strategy is more fun for students.

Variations in the Process of Using the Inductive Strategy
An inductive strategy can be more effective than a deductive strategy for teaching spelling patterns/ generalizations, but a variety of inductive strategies must be used. Variations within the inductive strategy help the teacher better utilize the learner's environment to facilitate learning, provide greater motivational latitude, and help the teacher more effectively adjust for differences in styles of learning. Such needed variation, unfortunately, is often lacking. Three broad variations for using the inductive strategy in teaching spelling are prearranged-data, experiential, and investigatory approaches (Rowell, 1979).

The Prearranged-Data Approach
The prearranged-data approach is by far the most common of inductive strategies for teaching spelling patterns/generalizations, In this approach the teacher provides the information or data needed for students to learn the pattern/generalization being taught. A worksheet or chart (teacher-made or commercially produced) is provided. Words having any of several kinds of patterns (phoneme-grapheme correspondences, morphological generalizations, or patterns relating to meaning) are provided. For example, the chart in Figure 1 might be used to teach students how to spell the long a sound or phoneme 5"/ in the final position in a word.

Figure 1: Words for Helping Spell the Long *a* Sound

1. pay	2. acorn	3. today
4. bay	5. they	6. gray
7. obey	8. paid	9. day
10. stay	11. may	12. able

Students might be asked to

(1) determine where in each word the long *a* sound is heard,
(2) underline the words that have the long a sound in final position in the word,
(3) tell the two ways that the long a sound in final position is spelled in these words, and
(4) write a statement about the most common way to spell the long a sound in final position.
The teacher may go further and ask students to verify their statements by examining a second list, which has a larger number of words with the long a sound.

The prearranged-data approach to inductive teaching is relatively easy to use in the classroom. It calls for less time on the student's part than do other inductive strategies. It calls for more teacher preparation time than other inductive approaches, although commercial materials, if used, alleviate some of this problem. Teachers who use the prearranged-data approach to inductive teaching should utilize some variations within this approach. In Figure 2 one variation is given. The words in Figure 2 are already grouped, and questions about the groups appear directly on the chart.

Figure 2: Words for Spelling the *f* Sound

1	2	3	4	5	6
fun	phone	staff	graph	rough	self
fish	phoney	stuff	Ralph	tough	goof
fast	photo	stiff		enough	deaf
far	phase	puff			leaf
fill		off			

Questions
1. How is the *f* sound spelled when it is the first sound heard?
2. How is the *f* sound spelled when it is the last sound heard?
3. Where in your dictionary could you look to tell which is the most common way to spell the f sound in first position? Do this. What is it?

Puzzle-like activities can add another variation in the prearranged-data approach. Students can be asked, for example, to write the missing words in a series of spelling squares by examining words that have already been paired. Figure 3 presents an example:

Figure 3: Spelling Squares for Learning to Spell *ing* Words

kid kidding	bat batting	bob bobbing
bid bidding	bet betting	fib fibbing
rid _____	hit _____	rob _____

Students are asked to
(1) spell the word that is left out in each square by using the paired patterns and
(2) write a statement about the adding of ing to these verbs.
This spelling squares activity can be used in contrast with squares where other *ing* words are used (e.g., words ending in final *e).*

Manipulatives can add yet another dimension within the prearranged-data approach to inductive teaching. Envelope activities are especially conducive to the inductive development of generalizations. An example follows in Figure 4:

Figure 4: An Envelope Activity for Learning How to Spell *ing* Words

Directions

1. Look at the words in the box. Say them.

fish-fishing tell-telling hunt-hunting

2. Put the words and word parts inside this envelope together. They make bigger words just like the bigger words in the box.
3. Write the *bigger* words that *you* make on your paper.
4. When is *ing* added to words such as those you have added it to? Make a statement about this, and write it on your paper.

In this activity, the words and word parts (about twelve base words with a separate *ing* word for each) when put together would constitute the data needed to make the generalization being taught.

> Generalizations where the final *e* is dropped before *ing* is added can easily be taught by changing direction 2 to read "Put the words and word parts together. Cover the final *e* of the base word like this: ride ing ride ing . Likewise the generalization of adding *ing* to a word where the final consonant is doubled, as in *bat* to *batting*. can be taught by changing direction 2. However, a third word-part card with the letter being doubled must be provided The students would be told to add the doubled letter (t) to bat so that it looks like this: batt ing

The data are "prearranged" in the sense that the envelope activity is preconstructed, although students must participate more in developing the data than they do in developing charts such as those in Figures 1 and 2.

The variations that can be introduced in the prearranged-data approach to inductive teaching are numerous. No teacher should use only one variation to this approach.

The Experiential Approach to Inductive Teaching

In the experiential inductive strategy, the background experiences of the students are used to amass the data. However, the teacher controls the process by first establishing the conditions for generating the data. For example, in teaching when the *k* phoneme /k/ is spelled *ek,* the teacher asks students to think of as many words as they can in which /k/ is heard at the end of words. The words are written by the teacher on the chalkboard or chart. A list such as the following could easily be developed:

sick cook leak quick take lack tock book duck rack clock wreck rake lick

After such a list has been compiled, questions are asked which lead to classification of the words according to how the /k/ is spelled. Students may be asked to regroup the words on paper. One student might then be asked to place his or her list on the chalkboard. The largest group of words, of course, would be those in which the *ck* is used to spell the /k/ when the preceding vowel sound is short.

A variation of the experiential approach to inductive teaching could be to have students work in small groups to develop a list of words that collectively will become the data to be studied. After several lists have been placed on the chalkboard, each group works together to determine how the words would be placed in categories and why. The conclusion of each group's work would be the writing of the generalization to be learned and, in some instances, verifying the generalization made.

The experiential approach is somewhat more time-consuming than the prearranged-data approach to inductive teaching in that it takes longer to amass the data provided by the students and collectively placed on a chart or the chalkboard. However, the experiential approach adds variation to the inductive strategy and should be used to augment the prearranged-data approach.

The Investigatory Approach to Inductive Teaching

The investigatory approach to inductive teaching focuses on students finding data in their environment, as opposed to recalling words with specified features or using prearranged data. Suppose the teacher plans to teach the morphological generalization that *er* added to certain verbs changes the words to nouns and changes the meanings of the words. The students are given the task of finding as many words as they possibly can with *er* at the end of them. Practically any written materials in the school environment can be used as sources when the search phase of this activity is to be done in school. Newspaper headlines, advertisements, books, supply catalogs, and bulletin boards are just a few such sources. Any word ending with *er* is accepted at this stage of data gathering.

After adequate time has been given for the students to find two dozen words or more ending with *er,* the teacher places the collection on a chart. Students then are told to study the words to see if some of the words are formed in a similar way. Some discussion of "base word plus *er"* may be necessary if students have not had much experience with the influence of word structure on meaning. Students then are asked to make two or more groups of words according to what they think is logical. Through skillful question ing, the teacher guides the students to see that *er* in such words as *teacher, painter, singer, worker*, and *trainer* changes the words to mean one who does whatever is stated in the base word. Such other words as *sweeter, longer*, and *brighter*, which might have been found by students, are not necessarily ignored. Instead they are contrasted with the group of words isolated for teaching the target generalization. If other words ending in *er* are among the collection or pooled list, they too are used for purposes of contrast. Such words as *mother, other, father, brother*, and *carpenter*, where the *er* is not a morpheme but an integral part of the words, can easily be explained.

The investigatory inductive approach, like the experiential approach, may be more time-consuming than the prearranged-data approach to inductive teaching. However, the search for data in the investigatory approach does not have to be done in class but could easily be a homework assignment, thus introducing a meaningful variation to this approach. The assignment could be done over several days, with the students not only searching for one, but several categories of words, all of which would eventually be used in arriving at several generalizations (not necessarily at the same time). A collectors' chart could be developed and meaningfully used in spelling classes. Words in the collector's chart are added until there are enough words to teach each desired generalization/pattern. Students not only are led to discover each generalization/pattern to be taught, but are encouraged to use the words in their daily writing.

Summary

Inductive teaching is a meaningful strategy for teaching spelling generalizations/patterns. However, this strategy can be subject to criticism if its use is limited to only one of the three basic approaches described or if within an approach there is not variation of the strategy. Alternating prearranged-data, experiential, and investigatory approaches of the inductive strategy should enhance the effectiveness of teaching spelling generalizations and patterns.

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Spelling and Reading

4. Selecting Spelling Words Using a Synthesized Approach

Gail B. Culyer

There is considerable agreement that
(1) spelling is important, and
(2) the schools are not teaching children to spell well (Temple and Gillet, 1984).
Indeed, many current recommendations are identical or similar to those *offered* thirty, forty, or even fifty years ago. Although "we have been teaching spelling in schools for centuries, . . . in many ways spelling instruction has not changed much" (Temple and Gillet, 1984. p. 383).

Considering the research findings in historical and more recent sources, a case can be made for a synthesized approach to the selection of spelling words. The remainder of this article considers four topics:
(1) the nature of the relationship between reading and spelling,
(2) the nature of the relationship between spelling and writing,
(3) a prototype for creating a basic spelling word list, and
(4) results and recommendations.

The Nature of the Relationship between Reading and Spelling
There is general recognition that language development observes the sequence of listening, speaking, reading, and writing (Betts, 1946). Writing may be said to consist of spelling, handwriting, and composition.

The decoding process begins to develop before the encoding process. This is true both in the oral medium for listening and speaking and in the graphic medium for reading and writing (Betts, 1946). The sequence is logical, especially when one understands that recognizing a message requires a simpler cognitive ability than reproducing it (Bloom, 1956; Gates, 1922; Hollingworth, 1918).

A user of language generally begins to acquire competence in recognizing printed words (one component of reading) before learning to reproduce (spell) them. An understanding that reading precedes spelling and serves as a readiness agent (Betts, 1946; Johnson, et al., 1981) makes it possible to note and build on the relationships between the two processes.

The following four types of general comments are based on the interrelationships between reading and spelling.

1. Children should be able to pronounce words they are asked to spell. A number of writers have suggested that children should either be able to pronounce the words before the spelling items are presented or that a pronunciation exercise be included as one component of the introduction to the spelling assignment (Beers and Beers, 1980; Burns et al., 1971).

2. Children should know the meaning(s) of words they are asked to spell. A number of writers have stressed the close relationship between spelling and vocabulary knowledge of the words involved (Burns et al., 1971; Haven, 1983; Gates, 1922; Hildreth, 1955). Long ago Morphett and Washburne (1929) noted,

"It is palpably absurd to train children to spell a word correctly when they do not know its meaning" (p. 196).

Hollingworth (1918) conducted a study in which she found that "knowledge of meanings is probably in and of itself an important determinant of error in spelling; . children will produce about 66 2/3% more of misspellings in writing words the meanings of which they are ignorant or uncertain than they will produce in writing words the meaning of which they know (pp. 44-45)."

Two decades later Reed (1938) found that a class taught word meanings and spelling gained and retained more than a class taught just spelling,

3. Children should be able to read the words they are asked to spell. Reading is more than simply decoding words or supplying definitions (Hildreth, 1955). Thus some writers have listed the ability to read words in context as a prerequisite to effective spelling study (Dolch, 1942; Hildreth, 1955; E. Horn, 1954; T. Horn, 1969).

In 1958 Stauffer suggested, "A rule of thumb that might be declared is always avoid asking a child to spell a word he cannot read, regardless of the curriculum area in which it occurs" (p. 210). Johnson et al. (1981) similarly felt that "Children should not be expected to learn meaning, pronunciation, and spelling simultaneously" (p. 581).

In an early study, Standing (1929) found that words frequently encountered in primary children's reading materials were spelled correctly more frequently by these children than were words they had not encountered. Approaching spelling in terms of retention rather than initial acquisition, Gates and Chase (1926) observed, "Once the spelling of a word is learned, it is probably kept alive in no small measure by being perceived repeatedly in the process of reading as well as by experience in writing" (pp. 290-291).

Betts (1946) appears to have been the first to recommend that a child possess a speaking vocabulary of five thousand words and a reading vocabulary of at least three hundred to four hundred words as spelling readiness. Dawson and Dingee (1959) have advised, "A child should be able to read with fluency and ease materials at the first reader level before systematical spelling instruction is begun- (p. 61). Donoghue (1971) has suggested that a child should be able to recognize and pronounce three hundred to four hundred words from the first-grade reading program as part of his spelling readiness.

4. Children should read materials that are equal to or more difficult than their spelling materials. As early as 1945, Zollinger suggested that the grade placement of spelling words should correspond with the reading vocabulary in common use at the various grade levels. A generation later Bond and Tinker (1967) wrote, "Difficulties arise, for example, when a youngster is expected to spell a word and use it in his writing when he has not learned to recognize it in his reading" (p. 141).

One criterion for selecting spelling words can be derived from these four general comments concerning the relationship between reading and spelling: spelling words should have been previously presented in reading instruction.

The Nature of the Relationship between Spelling and Writing

Some writers have suggested that spelling lists be based on words that are also high frequency items in children's writing (Rinsland, 1945). E. Horn (1954) contends that teachers should ask two questions before selecting a word for inclusion in a spelling list:

First, is it likely to be written frequently this year, either in school or out, after the unit has been completed?
Second, is it probable that it will continue to be written frequently in subsequent grades and in adult life (p. 10)?

A study of the effectiveness of five language arts methods in grade one showed that spelling achievement was most enhanced when composition instruction was related to the basal reading selections. On the other hand, direct teaching of spelling words without consideration for their use in reading or application in writing was associated with lower levels of spelling achievement (Callaway et al., 1972). If the findings prove true at levels above grade one, the implications for curriculum revision are fairly evident. Thus a second criterion emerges for the selection of spelling words for a basic list: choose items pupils are likely to need in their daily writing activities.

The Prototype

This writer has developed the following prototype for creating a basic spelling word list based on the two criteria mentioned above: the words' prior presentation in reading and the likelihood that the words would be useful in children's writing.

1. Select a reading series as one basis for identifying spelling words. Words that are presented in reading frequently become the spelling words for the following year. The writer chose the *Sheldon Basic Readers* for the purpose of identifying spelling words.

2. Prepare word lists from the teacher's editions for each grade level. This procedure involves the study of the total word list at each reading level to delete proper nouns, highly unusual words, foreign terms, and items that were previously listed as new words and inadvertently included a second time. If enrichment words are not subsequently presented as new words, list them along with the new terms presented at the next higher grade level.

1000 words (from the Rinsland List) account for
89% of all words that children use in their writing, . . .
2000 words account for 95%, . . .
and 3000 words account for 97%. . . .

Within each grade level separate the words according to reading level (for example, 2.1 or 2-2). This strategy facilitates the selection of reading words presented earlier in the series, which are more likely to have been encountered frequently in print. When word lists are no longer available, use the items identified at the beginning of each lesson in the teacher's edition.

3. Identify a children's writing list to determine each word's frequency of use by grade level. The writer chose for this purpose *A Basic Vocabulary of Elementary School Children* (Rinsland, 1945), a monumental compilation of words used in children's writings. According to a more recent study, "1000 words (from the Rinsland List) account for 89% of all words that children use in their writing , . . . 2000 words account for 95% , . . . and 3000 words account for 97% .....(Allred, 1977, p. 16).

4. Identify the frequency with which each reading word is used in children's writing. Record three sets of data for each word: frequency level for the particular grade, the grade above, and the grade below. For words presented at the first-grade reading level, record frequency data for grades one, two, and three. The reason for recording three levels is to facilitate the selection of high frequency words already presented at earlier reading levels but not selected for the previous grade of the basic spelling word list.

5. Determine the number of spelling words to be presented at each grade level. For the purposes of this study, three hundred words each were to he listed for grades 2 and 3, four hundred words for grade 4, five hundred words for grade 5. Each subsequent grade could have one hundred additional words. Following this pattern, the cumulative list at the end of grade eight would be 3,600 words. This number exceeds the total of 2,500-3,000 words which Hillerich (1977) claims will account for 96% of the words an adult uses. The teacher may select other important spelling items from content area studies or state or district-mandated word lists.

6. Identify the words for each spelling level based on their prior presentation in reading and their frequency in children's writing. Study the first-grade reading words, and from this group of words assign the most frequently used items, as determined in Step 4, to the second-grade spelling list. When developing the third-grade spelling list, consider the most frequently used words from both the first and second-grade reading lists.

7. Develop a master list of words assigned to each spelling level. Eventually these words should be grouped in some manner.

Results and Recommendations

Use of the prototype outlined above resulted in the development of basic spelling lists for grades 2-5. Table 1 includes spelling words for grade 2 which (1) were previously presented in reading in the *Sheldon Basic Readers* and (2) were used with high frequency in A *Basic Vocabulary of Elementary School Children* (Rinsland, 1945). The words were grouped according to phonological generalizations in spelling (Dolch, 1942; G. Culyer, 1975a, 1975b), an aspect of the study which is not reported here.

TABLE 1.

Grade Two List of Spelling Words Occurring in *Sheldon Basic Reading* Series and Rinsiand's A Basic Vocabulary of *Elementary School Children*

List 1	List 2	List 3	List 4	List 5	List 6
1. big	1. see	1. he	1. for	1. to	1. with
2. be	2. same	2. here	2. farm	2. too	2. want
3. boy	3. school	3. have	3. fall	3. take	3. we
4. ball	4. so	4. had	4 fast	4. tree	4. will
5. books	5. saw	5. her	5. fish	5. tell	5. went
6. a	6. said	6. home	6. four	6. time	6. two
7. I'll	7. Store	7. house	7. five	7. tomorrow	7. she
8. I	8. are	8. hear	8. fire	8. toy	8. you
					9. won't

List 7	List 8	List 9	List 10	List 11	List 12
1. come	1. make	1. do	1. go	1. play	1. the
2. can	2. my	2. dog	2. girl	2. put	2. that
3. cat	3. mother	3. down	3. good	3. people	3. this
4. coat	4. me	4. daddy	4. gave	4. please	4. they
5. call	5. Miss	5. did	5. get	5. pig	5. there
6. cake	6. man	6. dear	6. dolls	6. plays	6. their
7. can't	7. made	7. don't	7. give	7. were	7. then
8. coming	8. much	8. didn't	8. guess	8. where	8. these
9. all	9. more	9. does	9. three	9. played	9. those
				10. could	10. that's

List 13	List 14	List 15	List 16	List 17	List 18
1. little	1. run	1. not	1. and	1. am	1. out
2. like	2. red	2. now	2. bird	2. him	2. feet
3. look	3. rabbit	3. name	3. place	3. them	3. cat
4. lives	4. ran	4. no	4. best	4. came	4. street
5. long	5. ride	5. next	5. would	5. from	5. one
6. light	6. read	6. new	6. old	6. fun	6. coat
7. lost	7. ready	7. night	7. kind	7 funny	7. cut
8. why	8. runs	8. who	8. food	8. grow	8. what
9. up	9 rabbits	9. car	9. told	9. party	9. first
10. us	10. horse	10. your	10. yard	10. show	10. but

List 19	List 20	List 21	List 22	List 23	List 24
1. shoes	1 find	1. under	1. into	1. as	1. truck
2. was	2. ducks	2. birthday	2. water	2. hat	2. green
3. years	3. ground	3. good-by	3. after	3. an	3. brother
4. his	4. found	4. today	4. sister	4. at	4. grass
5. is	5. hand	5. candy	5. it	5. has	5. brown
6. cows	6. of	6. children	6. it's	6. before	6. light
7. things	7. around	7. door	7. let's	7. thank	7. must
8. hop	8. jump	8. set	8. let	8. think	8. talk
9. how	9. money	9. lunch	9. work	9. back	9. walk
10. our	10. about	10. squirrel	10. its	10. catch	10. table
		11. took	11. white	11. pet	11. should

List 25	List 26	List 27	List 28	List 29	List 30
1. bed	1. day	1. barn	1. in	1. story	1. letter
2 hen	2. way	2. soon	2. if	2. many	2. better
3. yes	3. may	3. garden	3 hit	3. happy	3. dinner
4. ten	4. say	4. on	4. wish.	4. very	4 over
5. once	5. stay	5. kitten	5. milk	5. baby	5. never
6. when	6. away	6. men	6. sit	6. any	6. another
7. egg	7. know	7. buy	7. sing	7. train	7. fly
8. nest	8. across	8. by	8. bring	8. town	8. steep
9. dress	9. always	9. rain	9. window	9. bear	9. black
10. help	10. just	10. sun	10. something	10. box	10. glad
11. every	11. yellow	11. again	11. morning	11. thought	11. flowers

Two recommendations seem especially appropriate. First, this procedure should be replicated with other series of basal readers. Publishers using this prototype or some modification could develop a coordinated reading/spelling program rather than two discrete programs. This strategy is important because words vary considerably from one basal reading series to another (Rutter, 1976), and spelling lists include only a moderate degree of overlapping from program to program (Ames, 1965). Thus, one should expect very little congruence when reading and spelling vocabularies from two randomly associated series are presented for study.

Second, experimental investigations should be conducted to compare the effectiveness at a variety of grade levels of materials based on the prototype with those in a traditional spelling program.

This article has demonstrated that much of what we know about the interrelationships between spelling and reading and spelling and writing is old knowledge. The proposed prototype is an effort to encourage publishers and educators to take the next important step-that of providing appropriate spelling materials related both to pupils' reading knowledge and their writing needs.:

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Spelling and Computers

5. Color Coding Pronunciation with Binemic Phonics

Robert L. Trammell

In late 1981 I received an Apple II+ computer as a result of a Florida *Department* of Education grant authored by Dr. Edmund Skellings of Florida International University. Dr. Skellings (Personal Communication, 1981) had patented "The Binemic System-FM, a ... color display system [which] creates a visual language from the fluorescent colors on television and computer screens the same way natural languages make words out of sounds." My task was to create a computer-based color-coding system for the pronunciation of English words.

After considerable experimentation with a number of graphics packages, it became clear that only high-resolution graphics with large letters (20x12 spaces per screen) would produce clear and consistent letters in color. With high-resolution graphics, only five colors (plus a black background) are available, but the larger letters come in upper and lower-case, with clear ascending and descending elements.

The System

Five colors are sufficient to encode a significant amount of information about the pronunciation of most words, provided we use what is systematic in the sound-letter relationships to advantage. There are three facts about our spelling system that may be broadly incorporated into a limited color-coding system. First, eighteen consonant letters (all except x, c, and g) each represent just one consonant sound with a great deal of consistency, especially before pronounced vowel letters and at the ends of words. Second, a number of letters, especially in longer words, are best interpreted as being silent in decoding spellings. Third, the majority of unstressed syllables in words may be pronounced with a schwa or unclear vowel in normal everyday speech.

Since vowels and consonants *are* distinct *classes,* we may encode these three generalizations with just two colors: green for silent vowel or consonant letters, white for regular single and geminate consonants and blends, and white for the vowels of unstressed syllables pronounced with schwa—the most common unstressed vowel sound.

Now only three colors remain to encode the many diverse sound-letter relationships which cannot be handled with white and green. Since vowels and consonants are easily distinguished, we may use the three different colors with each class without fear of confusion. Still, the number of sounds represented by each of the single vowel letters will exceed by one to six, depending on the letter, the three distinctions the system can make. Fortunately, in a majority of words, the individual vowel letters and y only represent three or four of the four to nine different sounds they can represent.

We need to reserve one color, say orange, to mark the irregular relationships of both vowels and consonants. The two remaining colors, blue and purple, will then indicate regular sound-letter correspondences for non-schwa vowels and sequences of consonants which cannot be encoded in white, *e.g.,* consonant digraphs.

A great many vowel-letter correspondences may be encoded by assigning one color to phonically short vowels, say purple, and the remaining color, blue, to the long vowels and diphthongs:

Purple Vowel Words

bat	have
met	pedal
fit	give
pop	comic
but	puppy
book	rooky
gyp	gymnast

Blue Vowel Words

late	
Pete	be
bite	hi
note	go
cute	flu
food	boo
dye	my

Note that the final silent *e's* would be green.

Diphthongs. (two blue letters)

loud	how	coin	coy
out	now	oil	toy
our	owl	boil	boy

At this point, the color-coding system can be summarized as follows:
1. White for regular single and geminate consonants (puppy, Betty) and consonant blends (tree, split)
2. White for unstressed vowels and vowel digraphs pronounced as schwa (away, even, giant, monstrous)
3. Green for silent vowels and consonants (beat, right, through)
4. Purple for consonant digraphs and trigraphs and short vowels (she, match, phone, with, good)
5. Blue for long vowels (plate, need, night, boat, cue)
6. Orange for vowel subpatterns (a frequent correspondence which is not the expected long or short sound, *e.g.,* father, they, machine, broad) or irregular vowel or consonant correspondences (any, sew, could, who, quit, nation, machine).
   With just these six rules, ten of the twelve spellings of the long *e* sound can be unambiguously color coded.

B	BB	B G	BG	BG	GB W	GB	W BG	BG G	W GB W
be	beet	Pete	key	sea	Caesar	grief	receipt	people	amoeba

The *i* for the long *e* sound in *machine* would be orange, because it is a subpattern correspondence for the letter *i.* The *uay* in *quay* (ke) would be orange because it is irregular.

If we go from letter to sound instead of sound to letter, the system also works very well. Eight different pronunciations of the *ea* digraph can be clearly encoded.

BG	PG	GB	OW	BB	BP	GO	GG P
read	read	break	idea	create	theatrics	heart	earth

The last example, *earth,* demonstrates another use of purple. Many words with a vowel or vowel digraph before *r* have a *ur* sound. It is as if the various vowels preceding the *r* were silent and the *r* itself is pronounced as a vowel. Thus, one or two green vowels (for stressed syllables) or one or two white vowels (for unstressed syllables) before a purple *r* are pronounced */ur/,* as follows.

GP WP	WP	WP	GG P	GP	GP	GP	GP
murmur	better	color	earth	her	sir	word	fur

Vowels and digraphs before an *r* that are pronounced normally have their appropriate color; however, the color deemed appropriate will vary from one regional dialect of standard English to another because they are subject to *r*-control. *R*-controlled vowels are marked by a blue *r. R's* that do not influence a preceding vowel are white.

WBBG	BBG	BBG	BBD	PBBO	BBG	WBGB	BGB	OW	DW	OWW	OWG
rare	here	cure	Mary	marry	store	roar	air	car	start	are	jar

Note that the a's of the last four words are orange because the a is neither long nor short.

Both a and o frequently represent another sound which is neither long nor short—the *aw* sound, as in *law* and saw. Such a's and o's are usually followed by a silent vowel or consonant; hence, an orange *a* or o followed by one or more green letters usually represents the aw sound.

OGGG	OG	OG	OG	OGGG	OG	OG	OG
caught	draw	fall	talk	fought	Utah	broad	Paul

When white, *c* and *g* represent their hard sounds; when purple, they are soft.

W	W W	W W	W	P	P	P	GP
can	comic	gag	got	cent	since	gym	dodge

True consonant digraphs may be defined as a sequence of two letters representing one sound which either letter alone would not ordinarily represent, as in *the, ship, chat, phone.* These digraphs are written with purple letters. In many words the same sequence of letters represents a sound which one of the letters regularly stands for alone. White and green indicate the correct pronunciation of these pseudo-digraphs.

WG	WWG	WG	GW	WG	G W	WG	GW
Thames	school	ghost	know	sword	write	listen	who

Optional Additions

A couple of other consonant letter-sound correspondences may optionally be encoded with blue. As noted above, a purple *th* distinguishes the digraph in *thin* from the consonant sequence in *fathead* (with white *th)* and the pseudo-digraph in *Thames* with white *t* and green *h.* However the purple *th* digraphs of *thin* and *then* do not stand for the same *th* sound. The *th* of *thin* is voiceless and the *th* of *then* is voiced. The voiced *th* words may be encoded with blue:

Blue th words	*Purple th Words*
the	thick
though	through
thy	thigh
either	ether
bathe	bath

Blue may also be used to distinguish between the letter *s* representing an *s* sound and a *z* sound, as in *bus* with a white *s* and *busy* with a blue *s.*

Blue s Words	*White s Words*
has	gas
business	rescue
resist	resale
his	hiss

Ch as a purple digraph stands for the regular *ch* sound, as in *child.* The pseudo-digraph *ch* in *school* or *chorus* is marked with a white *c* and a green *h.* There still remains a fair number of words in which *ch* represents the sound of *sh* as in *chaise, machine, chute.* These *ch's* may be colored blue.

The Choice of Colors

The choice of colors is an arbitrary aspect of this color-coding system. What is essential is that the various sound-letter relationships delineated above be consistently coded with a particular color. For example, the system would still be the same if the long vowels were green and the short vowels were white and the diphthongs were purple, provided the necessary adjustments were made to keep the colors consistent with the sound-letter relationships and distinct from each other.

Although color coding may be limited to certain letters in words in order to sequence instruction or work on specific problems (such as digraphs or long vowels), the use of colors for this work should be determined by the choices made for the color coding of every letter in words, that is, by the complete color-coding system, whenever possible. The random choice of colors for particular instructional tasks without regard to the total system would only serve to emphasize certain parts of words, like final or initial consonants, or vowels, without demonstrating and contrasting the patterns underlying the entire spelling system. Several other dangers concerning the random choice of colors for particular purposes exist. Without a system to guide the selection of colors, different colors for the same letter-sound relationship may be used on different days by one teacher or by different teachers. This lack of consistency may confuse the students. The random choice of colors would also make it difficult to color code several sound-Letter relationships of different types in a single word without running the risk of overlapping colors and relationships.

Applications

In spite of the ultimate simplicity of this color-coding system, its mastery will best be accomplished in gradual steps. In fact the use of the total system with each letter of each word color coded at the same time may have few practical applications for two reasons. First, the student may be overwhelmed by the diversity of colors in a single word in the beginning and then, at a later stage, having mastered a number of sound-letter correspondences, the student will not need help with many letters in the word. Second, the preparation of materials is considerably slowed by frequent changes of color. The system may thus be best used by applying it in a piecemeal fashion according to the needs of the student.

Since pattern and color are right-brain activities, while structure is a left-brain activity, color coding may lead the student to use both hemispheres of the brain in the same way normal students do when they seem, unconsciously, to see the patterns underlying our spelling system.

Color Coding for Remedial Students

In order to read on grade level a student must be able to decode rapidly enough to put the individual words into phrases and the phrases into sentences for comprehension (Eeds, 1981). Most remedial readers do not decode well enough, or at least rapidly enough. Color coding will help them to see the patterns which underlie the pronunciation of printed words and the exceptions to those patterns. Since pattern and color are right-brain activities, while structure is a left-brain activity (Vitale, 1982), color coding may lead the student to use both hemispheres of the brain in the same way normal students do when they seem, unconsciously, to see the patterns underlying our spelling system (Fox, 1979). The fact that females in our culture have shown a degree of right-brain dominance over that of males may explain why female students are frequently better spellers and readers in their early schooling. A predominately left-brain approach to decoding may run afoul of the many irregularities, inconsistencies, and ambiguities in our spelling system because it is too analytical.

Color coding may be of assistance to remedial readers in either a synthetic or analytic phonics approach, or a combination of the two. Synthetic phonics involves breaking a word into separate letters or digraphs with their corresponding sounds, and then blending or synthesizing the sound-letter groups into the whole word. Phonics generalizations or rules may be taught at the same time. Analytic phonics avoids the overt teaching of phonics rules and the breaking of words into letter-sound sequences by presenting large numbers of whole words with the same letter-sound relationship at the same time.

Color coding can enhance either approach by helping the student to see more clearly the regular relationship between the letters and the sounds and the exceptions. The addition of an extra cue system may enable remedial readers to succeed where they have failed before, building their confidence and encouraging them to keep trying.

Color coding will reduce the amount of decoding required to read many words. The remedial reader can usually handle regular one and two-syllable words with a fairly consistent relationship between the number of letters and sounds and some high frequency words with irregular spellings. But when faced with longer words and/or words with a disparity between the number of letters and sounds and some less regular sound-letter correspondences, the remedial reader does not have decoding tactics equal to the task. He or she either recognizes a word as a whole word configuration, uses context to identify it, or gives up. By reducing the decoding load, we match the task more closely to the reader's capabilities. Color coding reduces the load in several ways. Green letters do not have to be sounded. They are the silent part of the pattern. Adjacent purple consonant letters (digraphs and trigraphs) make one sound together. White vowel letters (whether a, e, i, o, or u) represent an unstressed uh sound. Short vowel sounds are marked with purple, long vowels and diphthongs with blue. The color code helps to take the guessing out of reading. The student can more easily go from letters to sounds to meaning, because the number of choices presented by the spelling system have been greatly reduced.

Unlike some previous systems, which had a separate color for each sound or each vowel sound, this color-coding system forces the student to recognize and identify each letter in the word by shape as well as color (Gattegno, 1966; Bannatyne, 1971). That is, the color blue alone indicates only that the vowel letter stands for a long sound. The student must still identify which vowel letter to get the appropriate sound.

Color-Coding in the Classroom

Most children learn to distinguish eight basic colors long before they master reading. Many children experience difficulty in developing adequate decoding skills, but very few normal children fail to learn their colors. Color coding, then, may help normal children to read faster and remedial students to read at grade level by enabling them to see more quickly which sound the letter or digraph stands for in a word when there are several possibilities. For instance, is the *i* in *inch* sounded as the *i* in *find,* or *in,* or *machine?* The fact that the *i* would be purple in *inch* and *in* (a word the student knows) but blue in *find* and orange in *machine,* would lead the student to the correct answer. As for the *ch,* does it stand for the *k* sound of *character,* the *sh* sound of *machine* or the *eh* sound of *much?* The *ch* in *inch* and *much is* purple (a digraph); in *character,* the *c* is white (hard *c)* and the *h* is green (silent); and the *ch* in *machine* is orange.

Color coding may be of assistance to remedial readers in either a synthetic or analytic phonics approach, or a combination of the two.

These multiple decoding possibilities for many single letters and potential digraphs (for instance, the *sh* in *fish* and *mishandle)* are a hurdle to the beginning or remedial reader. Color coding will delimit the possibilities and focus the reader's attention on the appropriate graphic units, not on extraneous information such as silent letters. *Through,* for example, would have a purple *th,* white *r,* blue *u* (for the long *u* sound) and green *o, g,* and *h* (for silent letters).

Of course, students must first be taught the color-coding system before they can benefit from it. Fortunately, there is little in the system that is not taught in elementary school phonics between grades one and four. Most children are exposed to long and short vowels, diphthongs, digraphs, blends, silent letters, and accent in their basal reading series and phonics workbooks. While color coding in expanded print on the computer screen is the most dramatic way to present and produce materials, this system can be used with color markers, chalk or crayons. With whatever phonics materials, the equation between the phonics concept being taught and a single color should pose no problem for the student.

Although our color-coding system is not restricted to computer applications, computers and software widely available today make the extensive utilization of color coding in regular and special classrooms more feasible. Color-coded materials for lessons can be typed onto the screen with any of several

character generators (such as the Aldrych system or the E-2 Draw package) which allow for expanded letters in upper and lower case with a minimum of five colors (plus background). These lessons can be saved as high resolution graphics screens or as part of programs written in BASIC (such as Edmund Skellings's Electric Poet for the PC Jr). The speed of production on the computer is much greater than the speed obtained using chalk or color markers. The lessons stored on disks are easily cataloged, retrieved and reproduced. The classroom utilization of color coding in other mediums is very cumbersome by comparison.

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