Is children's spelling naturally stage-like?

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Abstract. Children's spelling development is often described by researchers and educators as proceeding through a series of stages. Two properties of stages were analyzed in this study. If spelling development can be characterized by stages, then it should be possible to observe qualitatively different spellings at different points in development. In addition, spellings within a point of development must be consistent. Spelling samples were obtained from stories written by children in first through sixth grade. Stage classifications of spellings for (a) silent -*e* long vowel words (e.g., bake), and (b) regularly affixed past tense words phonologically represented as /t/ (e.g., *helped*), /d/ (e.g., *opened*), and /əd/ (e.g., *listed*) were analyzed. Little evidence was found for either predicted qualitative differences in stage classification of errors or in stage constancy across grades. Implications for theories of spelling development and instructional practice are discussed.

Key words: Spelling, Spelling development, Spelling stages, Spelling strategies

Introduction

Mastering the spelling system is an enormous developmental task. Not only must children learn to map meaning-based sounds (phonemes) onto letters (graphemes) but they must learn a large number of letter combination rules (orthography) and at least as many exceptions due to affixation, assimilation, and the influx of new words (morphology) to the English language. Most of our understanding about spelling development is based on inferences made from examinations of children's spelling errors. These errors provide fascinating insights into how children understand the sound and spelling system of the English language (Stage & Wagner 1992).

Error analysis has been used to infer prior knowledge and cognitive strategies children may have used in their spelling (extensive studies of children's spelling errors can be found in Read 1975; Treiman 1993). This approach has provided a wealth of information about children's phonological, orthographic, and morphological knowledge and how children may use their knowledge in translating oral language into a written form. Commonalities in errors made by children at a particular age or level of spelling ability have also led some

researchers to consider children's spelling development to occur in a stage-like fashion, with specific modes of thinking about and producing written language characterizing different points in development (Ehri 1986, 1992; Frith 1980; Gentry 1982; Henderson & Beers 1980; Morris & Perney 1984; Templeton 1991; Templeton & Bear 1992). The stage approach has been used to characterize children's knowledge of the language system at different points in time and to guide the development of spelling instruction (Henderson 1990; Henderson, Templeton, Coulter & Thomas, 1985).

The differences in the two approaches, namely describing the development of different types of knowledge and strategies children use versus the characterization of children as possessing distinctly different knowledge and strategies at different points in time, is reminiscent of a controversy that appears over and over in the developmental literature. How do children accomplish some complex cognitive developmental task? Does development of some cognitive ability result from the gradual buildup of increasingly mature cognitive strategies or patterns of thought or can it be more neatly characterized as progressing through a series of stages?

The goal of this study is to examine the stage-like nature of children's spelling development. How we view children's spelling development has important implications for cognitive developmental theories of children's spelling as well as for instructional practice. In terms of cognitive developmental theory, it is essential to have an accurate and complete description of children's cognitive processes in order to understand developmental and individual differences (Siegler 1994, 1995a, b). Furthermore, given that systematic instruction is likely to be most successful if it is developmentally appropriate, it is important to know the extent of children's knowledge and preferred modes of thinking.

Spelling knowledge and spelling strategies

According to Read (1975; see also Ehri 1986; Gentry 1982), very young or beginning spellers may depend on an alphabetic or letter name strategy where the letter of the alphabet is used to directly represent the sound. For example, in spelling the word *bee*, the child may simply use the letter 'B'. Treiman (1994; Treiman & Cassar, in press) showed that use of the letter name strategy depends upon the phonological properties of the letter's name. For example, the letter name for *r*, pronounced *are*, is more likely to elicit a letter name spelling, such as 'cr' for *car*, than is the letter name for *t*, pronounced *tee*.

As children acquire a more sophisticated understanding of phoneme-to-grapheme correspondences, their spellings reveal less reliance on the letter name strategy (Gentry 1982; Treiman 1993, 1994). In developing these phoneme-grapheme relationships, children more consistently sound out

words and match sounds with specific letters in a linear fashion (Morris & Perney 1984), such as segmenting the word *cat* into the phonemes, /k/, /æ/, and /t/, and representing each respective phoneme with a grapheme, 'c', 'a', 't'.

The sound to letter correspondence may not always be linear, however. There are instances where there is one sound to one letter, but there may also be one-to-many or many-to-one phoneme-to-grapheme relations (Treiman 1993). For example, /i/ can be graphemically represented as 'ea' in *seat*, 'ee' in *week*, 'ei' in *receive*, and 'ey' in *key*. On the other hand, /θ/ and /ð/ are both represented by 'th', as in *thigh* and *thy*.

These inconsistencies create irregularities and ambiguities, and therefore, if a speller were to solely rely on phoneme-to-grapheme correspondences, misspellings would predominate (Gough, Juel & Griffith 1992; Kreiner & Gough 1990). According to Morris and Perney (1984), as children begin to realize the inconsistencies of fixed phoneme-grapheme relationships, they begin to identify common patterns of letters as a result of increased knowledge of semantics, syntax, and phonology. The impact of this orthographic awareness on children's spering has been demonstrated by Laxon, Coltheart, and Keating (1988). They demonstrated that words with many orthographic 'neighbors' are more 'friendly' for children, and are thus spelled with greater ease and correctness than words that do not share similar letter patterns with many other words. For example, *same* has many orthographic neighbors such as *name, lame, sane,* etc. and is therefore easier to spell than *neck*.

Understanding orthographic similarity in the writing system may occur through increased experiences with reading and writing (for comprehensive reviews and analysis see Adams 1990; Ehri 1986; Read 1975; Treiman 1993). For example, children rarely experience 'ey' in the middle of words and therefore would not be expected to produce many spellings of words with a medial /i/ with 'ey' Medial combinations of 'ee' and 'ea' however, are both quite frequent; therefore even older, more experienced spellers might be expected to make substitution errors such as 'feal' for *feel* and 'heer' for *hear*.

Recognizing and using orthographic similarity appears to be a useful strategy when the common orthographic units correspond to the intrasyllabic linguistic *rime*, the vowel and following consonants in a syllable or in a one-syllable word, such as 'at' in *cat, hat, rat,* etc. (Goswami 1988; Treiman 1992, 1993; Treiman & Zukowski 1988). Orthographic knowledge may also have an influence at an earlier point in learning to spell than previously thought. Although Stage and Wagner (1992) reported developmental variation in the use of orthographic knowledge in spelling by children in kindergarten to grade three, the major origins of individual and developmental differences seemed

to be in working memory and phonological processing. Based on both error analyses and results from experimental studies of children's awareness of orthographic constraints (e.g., the consonant cluster, 'ck', does not occur at the beginning of the word), Treiman (1993) concluded that even beginning spellers in grade one have a rudimentary understanding of English orthography and use this knowledge in their spelling.

As children develop increased experiences with the words in their language, they also develop an understanding of the internal structures of words as well as relationships among words in the language. This form of linguistic awareness is referred to as morphology and involves the recognition of word roots and their applicable affixes. In certain instances, the pronunciation of the root alone in an inflected word differs from the pronunciation of the root, as in *signature* and *sign*. Morphological awareness of the root *sign* in *signature* allows for recognition and graphemic representation of the silent 'g' in *sign*. Several studies with older children have noted the importance of morphological strategies in the development of spelling (Sterling 1983; Morris & Perney 1984; Bruck & Waters 1990; Waters, Bruck & Malus-Abramowitz 1988).

Morphologically based spelling strategies may occur slightly later in development than phonological and orthographic strategies. For instance, Treiman (1993) found that until grade one children had developed an awareness of the English morphological system, they based their spelling of affixes, such as the past tense morpheme, -*ed*, in *helped*, on phonological representations, e.g., 'helpt' . In an experimental study, however, Treiman, Cassar, and Zukowski (1994) found that although morphological knowledge develops in sophistication, even very young children can use simple morphological information as an aid to spelling. For example, they found that kindergarten children could spell the 't' in *dirty* based on their knowledge of *dirt* whereas they represented the 't' in *city* with a 'd'. On the other hand, Waters, Bruck, and Malus-Abramowitz (1988) found that morphological strategies were not readily apparent in children's spellings until grade six. Grade three students, for example, appeared to rely predominately on their understanding of phonology and orthography in their spelling. Consequently, morphology was felt by Waters et al. to be the most difficult type of linguistic information for children to acquire.

Although children may have preferred approaches to spelling at different ages, they do appear to have a wealth of understanding about the English writing system at all ages. Treiman's (1993) study of naturalistic writing obtained from grade one children demonstrated that even beginning spellers understand a great deal about the relationships among phonemes and graphemes, orthographic conventions, and morphology. Waters' et al. (1988) and Bruck

Table 1. Developmental stages in children's spelling

Stage	Example	Characteristic knowledge/strategies
Precommunicative	Λ	Symbols stand for words
Semiphonetic	AC	Partial sound out strategy Alphabetic strategy
Phonetic	lak	Sound out strategy
Transitional	laek	Some orthographic conventions recognized Beginning to see morphological relations
Correct	lake	Complete phonological understanding Orthographic conventions and rules Morphological relations Visual recognition and checking

and Waters' (1990) experimental investigations of older children's spelling test performance indicated that, although there are developmental and individual differences in use of different types of knowledge, all children were able to make use of varied linguistic information in words in their spelling.

Stage characterizations of children's spelling development

A popular conception of children's spelling development is that the phonological, orthographic, and morphologic information and strategies that children acquire follow a sequence of stages (Ehri 1986, 1992; Frith 1980; Henderson & Beers 1980; Gentry 1982; Templeton & Bear 1992). Each stage is characterized according to the predominant information and strategies used during that 'stage' of development. Gentry (1982) outlined five stages in his theory of how children learn to spell. The stages, examples, and types of strategies and knowledge that characterize each stage are shown in Table 1.

In the first, *precommunicative* stage, children combine letters and letter-like symbols in a relatively haphazard fashion, with no apparent knowledge of letter-sound correspondence, directionality, or letter case. In the *semiphonetic* stage, children represent a portion of the phonetic information in the word, appear to use their knowledge of letter names in their representations, and recognize the left-to-right directionality of the English language. The *phonetic* stage is characterized by systematic developments in letter-sound correspondence; children represent all of the phonetic information in the word but without regard to orthographic conventions. In the *transitional* stage, chil-

dren demonstrate their growing knowledge of English orthography as well as their beginning understanding of how morphemic information influences spelling. Children who have mastered the phonological, orthographic, and morphemic aspects of their written vocabulary are classified by Gentry as being at the correct stage of spelling.

Different researchers have posited the existence of slightly different stages. For example, Frith (1980) merged information and strategies important for reading and spelling. Ehri (1986, 1992) has described a stage similar to Gentry's transitional stage but has labeled it the *morphemic* stage to more generally describe the types of knowledge about the spelling system that are acquired during this stage. Henderson and his colleagues (Henderson 1992; Henderson & Templeton 1986; Templeton 1992; Templeton & Bear 1992) have elaborated the phonetic and transitional stages to describe different phonological and orthographic features within words, across syllables, and across morphemes. In addition, a number of recent stage theories do not include a qualitatively different 'correct' stage, recognizing that correctly spelled words are not necessarily spelled using qualitatively different processes from incorrectly spelled words. All stage theories, however, share common features, such as indicating qualitatively different skills and knowledge at the different stages as well as describing spelling development in terms of a transition from relying on phonological properties of words to recognizing and representing orthographic and morphemic regularities and rules. Gentry's stages are broad in scope and very commonly referred to in the educational literature (e.g., Henderson 1990; Wepner & Feeley 1993); hence, although we recognize there have been developments in stage theories of children's spelling over the past twenty years, we use Gentry's stages in the present investigation.

Besides generally describing children's spelling development, stage theories have been used as a foundation for the construction of spelling tests and to guide the development of instructional materials for teaching spelling. Morris and Perney (1984) created a spelling test and error scoring system based on developmental spelling stages for use with grade one children. Each word was assessed qualitatively and assigned a numeric score representing the developmental level of the spelling. For example, a spelling of *lake* as 'lt' was assessed as at a prephonetic stage (corresponding to Gentry's semiphonetic stage) and given a numeric score of '1' to indicate that no vowel was represented in the spelling. A spelling of 'lat' was also assessed as prephonetic but given a score of '2' to indicate that three phonemes, although not all appropriate, were represented. A representation in which an alphabetic strategy may have been used, 'lak', was assessed as phonetic and given a numeric score of '3'. Spelling *lake* as 'leak', in which the long vowel is represented

by an incorrect rule use, was assessed as transitional and given a score of '4'. Finally, if the word was spelled correctly, it was assigned a score of '5'.

Morris and Perney (1984) classified children according to their total spelling score and according to their developmental spelling stage based on the total spelling score. Developmental spelling stage was used to predict reading ability in grade one children. In addition, gains in spelling from the beginning to the middle of the school year were examined through movement through the spelling stages. In September, the majority of the children were classified as prephonetic or phonetic; in January, almost all of the grade one children had moved up a stage and were generally classified as phonetic or transition/correct spellers based on their performance on a spelling test of mostly one-syllable words. Morris, Nelson, and Perney (1986) described the traditional spelling test score of number of correctly spelled words as representing spelling power and their qualitative developmental stage scoring system for incorrectly spelled words as representing spelling quality. The argue that children should be grouped according to their spelling level as opposed to grade; children who spell few words correctly not only need to learn more words than children who spell more words correctly, they also have to learn more about the nature of the English language writing system. Recently, Morris, Blanton, Blanton, Nowacek and Perney (1997) have demonstrated that children who score at lower levels on graded tests benefit more from instruction using a lower grade text than when using a grade-appropriate spelling book.

Developmental stages and instructional levels form the basis for at least one spelling curriculum (Henderson 1990; Henderson, Templeton, Coulter & Thomas 1985). For example, according to Henderson (1990), instruction for beginning spellers should center around learning letter names, then recognizing the differences between vowels and consonants. Once the child has this foundational knowledge, the curriculum processes to emphasizing short vowel patterns (e.g., h_a_d, h_i_d), then consonant blends (e.g., _drum_, _trap_), followed by long vowels (Henderson et al. 1985; Templeton 1991). Long vowel instruction should begin with the silent -e rule (e.g., c_a_m_e_, b_a_k_e_) then other common long vowel patterns (e.g., ch_ai_n, r_ai_n). This sequence of instruction should follow children from the semiphonetic stage through the phonetic stage and into the beginning of the transitional stage of spelling. Further into the transitional stage, when children recognize syllabic patterns, then children can begin to be taught about affixes, such as the -ed past tense inflection (Henderson 1990). The goal of this developmental spelling curriculum is to gear systematic instruction to the child!s stage of development (Templeton 1991). Similarly, in a general introduction to language arts in the literature-rich classroom, Wepner and Feeley (1993) elaborated on Gentry's (1982) stages, including the 'correct' stage, in describing children's spelling development.

Evaluation of spelling stages

Outside of providing a very general description of spelling development, being used to predict very specific individual differences on highly constrained spelling tests, and promoting individualized spelling instruction, we argue that stage theories of children's spelling are untenable and may even provide an incorrect characterization of children's spelling. For example, characterizing the young speller as being in the phonological stage, at best, may provide a limited description of the wealth of phonological understanding and strategies the child has and, at worst, may provide an incorrect description of the child as possessing no other understanding of the English writing system. In order to describe some phenomenon as stage-like, the developmental profession must adhere to several critical properties (Flavell 1971). Two are singled out in the present study for investigation.

First, stage-to-stage development involves qualitative changes (Flavell 1971). Thus, children in the phonetic stage must spell words differently than children in the transitional stage of spelling. Given that children in these different stages are presumed to be using different strategies, one would expect their errors to reflect these differences. In other words, a phonetic speller might be expected to spell *light* as 'lit', using an alphabetic strategy to represent the long vowel, whereas a transitional speller might use the long -*e* rule and spell '1ite'. What about a very young child who spells 'lite'? Is that child at the transitional stage? Or is the child using an alphabetic strategy and representing the unvoiced stop consonant with two components, the consonant sound and the air flow?

In the present study, we examined differences in spelling patterns across grades to evaluate the qualitative criterion for describing children's spelling errors as stage-like. If it is feasible to describe children's spelling development as progressing through stages of precommunicative, semiphonetic, phonetic, transitional, and correct spelling, we should be able to see these stages represented in the children's spellings at different grades. Children in early elementary grades should produce more precommunicative, semiphonetic, and phonetic stage spellings whereas children in upper elementary grades should produce relatively more transitional stage and correct spellings. Although not ideal for examining stages (Morris et al. 1986, 1997), grade was selected over instructional level because all children in a grade were receiving the same spelling instruction.

A second, related property of stages is that components that define a given stage develop concurrently (Flavell 1971). Phonological representation skills should therefore develop in the phonetic stage and orthographic knowledge and conventions should be built up in the transitional stage of spelling development. In other words, a child at the phonetic stage who uses an alphabetic

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strategy to represent the /ai/ in *light* as 'lit' should also misspell *my* as 'mi'. Similarly, the transitional child should overgeneralize the silent -*e* rule to spell 'nite' as well as 'lite'. In order to examine the relevance of the concurrence assumption for developmental spelling stages, we examined consistency in stage classifications of the words each child wrote.

In a larger study of children's spelling, we obtained naturalistic writing samples from children in grades one through six (Varnhagen, Pawlik, Burstow, Poon & McCallum 1995). The children's writing samples provide an excellent data set by which to evaluate the theory of developmental spelling stages. A naturalistic study provides the opportunity to examine how children spell in a non-restricted environment. Children are encouraged to draw upon their own linguistic repertoire, and these word selections are perceived to be a window into each child's creativity. Since they are under the impression that their writing will not be evaluated, the children are more likely to spell the way they normally would and are not required to recall or invent unconventional spellings, which is common in an experimental setting (Treiman 1993).

This methodological approach allows the researcher to examine a broad range of issues and not be limited by his or her own theoretical biases. Children write their own words, not words selected by the experimenter. By using a naturalistic writing sample, we were not biasing our results either toward or away from a stage description of spelling by either including or excluding words based on a stage description of spelling development. The writing samples allowed us to examine whether children naturally write words and make errors that are indicative of some developmental stage of spelling ability.

In collecting naturalistic writing samples, however, it must be acknowledged that children may not write words that they do not think they can spell correctly. We provided an interesting topic, "A Special Day", for the writing sample, to mitigate against the possibility of children limiting their writing. Another limitation of naturalistic writing samples is that there is little control over variables such as word frequency and word length that are well known to influence spelling. We selected word types for analysis that were relatively common in the children's writing and were also widely cited in the literature. Selecting word types that would yield large samples of data allowed for greater confidence in interpreting the results.

We concentrated on two spelling patterns that were emphasized in the literature as undergoing development across several spehing stages. The two patterns were: (a) marking a long vowel in a closed syllable with a silent -*e* at the end of the word, e.g., *lake*, and (b) affixing the past tense marker, -*ed*, e.g., *peeked* and *dragged*.

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According to Gentry (1982), children use an alphabetic strategy to spell long vowels in the phonetic stage (e.g., 'lak' and will use a number of alternative spellings based on their recognition of the phonetic nature of the vowel in the transitional stage (e.g., 'laik' and 'laek') before consistently representing the silent -*e* (e.g., 'lake') following mastering the rule. These same developments are represented in Morris and Perney's (1984) and Morris et al.'s (1986) error scoring systems. Henderson (1990; Henderson & Templeton 1986) has described children learning to spell silent -*e* long vowel words as they begin to understand the within-word orthographic pattern of vowels of the English spelling system. According to Henderson (1990), teachers should encourage children in the semiphonetic stage of spelling (i.e., children who do not understand within-word patterns) to recognize consonants and vowels and look for common orthographic patterns within words. Once children recognize within word patterns in the beginning of the phonetic stage, they should be taught to find and spell short vowel sounds and then long vowel sounds, starting with the silent -e orthographic pattern.

Spelling the past tense form of a verb correctly often requires an understanding of the morphological structure of the word. For example, a phonological strategy of sounding out the word will not yield the correct spelling of /t/ past tense words, such as *looked* and *helped* or for /d/ words, such as *opened* and *grabbed*, but can yield the correct spelling for /əd/ words, such as *listed* and *handed*. Recognizing the past tense morpheme, -*ed*, however, will allow the child to be able to spell at least the -*ed* portion of all three types of past tense words correctly. Morris and Perney (1984) represented the list word, *peeked*, as changing from 'pt' in the prephonetic stage to 'pekt' in the phonetic stage to 'peekt' (as well as 'peaked') in the transitional stage. According to Henderson (1990), teachers should not be concerned with teaching phonetic stage children about the -*ed* inflection. The spelling of affixed words, such as the past tense form of a verb, follows a slow development and instruction will not be of benefit until the transitional stage child can recognize the principles governing the spelling of affixed words, most importantly, the concept of morphemes.

Based on developmental stage theories of spelling, we would expect to see qualitative changes in children's spelling of long vowels and past tense words from grades one to six. The differences between the gades should be orderly and progress from semiphonetic attempts to phonetic representations to transitional errors to correct spelling. In addition, individual children should exhibit spelling patterns consistent with a particular developmental spelling stage.

Method

Subjects. The subjects were 272 native English speaking students attending a large elementary school in a middle- to upper middle-class neighborhood in Edmonton, Alberta, Canada. Data were obtained in late November from all children who returned signed parent permission forms. Two classrooms participated at each of first through sixth grade; stories were obtained from 39, 50, 39, 38, 52, and 54 children in first through sixth grade, respectively. Approximately equal numbers of boys and girls participated at each grade. Thirty-five stories were randomly selected from each grade for analysis.

School instruction. The elementary school was chosen to represent the provincially-mandated language experience approach to literacy instruction with complementary attention to extensive experiences in reading and writing as well as to the mechanics of reading and writing, i.e., 'phonics' was taught in 'whole language' classrooms (Adams 1990). A questionnaire was administered to teachers of participating classrooms to determine spelling instruction and activities used in each grade. The open-ended questions asked teachers to indicate (a) what types of spelling experiences and instruction they had provided in their classroom through the first third of the school year (the point at which the data were collected), and (b) what spelling skills and strategies they expected children in their classroom to know by this time in the school year.

Responses to the questionnaire are summarized in Table 2. The top portion of the Table indicates the type of instruction described by at least one of the teachers at each of the different grades. The entire school had elected to use a spelling curriculum based on orthographic patterns as an adjunct to their literacy instruction. All children received at least some direct spelling instruction, in terms of completing worksheets from the curriculum. In addition, teachers provided bridging instruction from the workbook to the children's written work, e.g., identifying incorrectly spelled words in the children's work that contained recently covered orthographic patterns.

The bottom portion of Table 2 contains spelling skills and strategies that at least one teacher from each grade indicated they expected their children to be familiar with at the time of testing. The check marks represent the grade at which the skill or strategy was first mentioned; many teachers in higher grades also indicated spelling skills and strategies reported by teacher in lower grades. The skills and strategies reported by the teachers provides an interesting developmental profession from attention to phonological patterns, consonants, vowels, and consonant blends, to increasingly sophisticated forms of affixation (e.g., plural, past tense, use of apostrophe) and morphological knowledge across the elementary school period.

Table 2. Type of instruction /experience provided and spelling strategies teachers expected students to hnow in November of grades one to six

	Grade					
	1	2	3	4	5	6
Type of instruction/experience						
Word of the day	x					
Rules, patterns, word origins	x	x	x	x	x	x
Personal dictionaries	x	x	x	x	x	x
Correct misspellings on written work	x	x	x	x	x	x
Spelling tests		x	x	x	x	x
Require correct spelling on some work		x	x	x	x	x
Encourage use of the dictionary		x	x	x	x	x
Proof reading and editing				x	x	x
Use spell-check on computer						x
Spelling strategies						
Recognize small words in larger words	x					
Word families	x					
Consonants	x					
Long and short vowels		x				
Silent 'ed'		x				
Consonant blends		x				
Capitalization		x				
Plurals			x			
Word origins			x			
Root words				x		
Past tense				x		
Consistent spelling of common words					x	
'ay' versus 'ey'						x
Use of apostrophe						x

Procedure. Children participated as a part of a whole-classroom assignment. The experimenters distributed lined foolscap (8.5 × 14 in) paper and a pencil without an eraser to each child. Children were instructed to write a story, to be titled "A Special Day", about any event they wished. They were told that the assignment was not a test and were encouraged to be unconcerned with correct spelling, grammar, and punctuation; if a child asked for a specific spelling during the assignment, the instructions were repeated to the entire class. Children were further instructed not to erase mistakes, false starts, or any other forms of editing but, rather, to cross out any words or sentences they did not want included; crossing out was demonstrated on the board as drawing

Table 3. Examples of the scoring system

Word type	Stage				Correct spelling
	Precommunicative	Semiphonetic	Phonetic	Transitional	
silent -*e*	wt	ac	lac	laek	lake
past tense					
/t/	l	het	helpt	helpped	helped
/d/	g	gabd	grabd	grabed	grabbed
/∂d/	s	lstd	listd	listted	listed

a single line through the unwanted information. Children were allowed 20 minutes to complete their story. In keeping with their usual classroom writing experiences, first and second graders were encouraged to draw a picture to accompany their story if they finished early.

Scoring. The children's writing samples were entered into a data base, with each record including fields identifying: (a) grade, (b) subject, (c) the child's spelling of the word, (d) correct spelling of the word, (e) number of instances of the child's specific spelling (Varnhagen, Pawlik, Burstow, Poon & McCallum 1995).[1] We searched the correct spelling field of the data base for all silent -*e* long vowel and regular past tense words. In addition, we searched the child's spelling of the word field to obtain possible cases of overgeneralizations of the silent -*e* rule and -*ed* word endings. Only words for which appropriate words could be identified were included; relatively uninterpretable letter strings (e.g., 'scwol' for what we thought might have been *squeaked*) were not included.

Children's spellings were scored according to developmental stage characteristics. We followed Morris and Perney's (1984) and Morris et al.'s (1986) examples as closely as possible but used Gentry's (1982) terminology. Exceptions to the procedures used by Morris and his colleagues are noted in the descriptions below. Examples of the stage classification system are shown in Table 3.

Silent -*e* long vowel words were classified as follows: The word was categorized as a *precommunicative* spelling if most of the phonemes in the word were not represented. A *semiphonetic* spelling included minimally the initial and final consonant letter and either did not include a vowel letter or included a phonetically inappropriate vowel. The word was classified as a *phonetic* spelling if the consonants were represented by appropriate letters (e.g., 'c' was considered an appropriate representation of the /k/ in *lake* in the phonetic spelling, 'lac') and the vowel was represented by the appropriate long vowel letter name. The child's spelling was classified as

transitional if an incorrect attempt was made to mark the long vowel sound. Correctly spelled words were classified as *correct*. Morris and his colleagues categorized various types of phonetic and transitional errors. According to their system both an incorrect long vowel marking (e.g., 'maek' for *make*) and an incorrect consonant phoneme representation (e.g., 'backe' for *bake*) could be scored as transitional; because in this analysis we were concerned with the development of long vowel spelling, the child's spelling was classified only according to the way in which the long vowel was spelled. Therefore, 'suprise' for *surprise* was scored as correct even though it was missing a consonant.

Children's *-ed* words were separated, based on the phonological properties of the *-ed* morpheme, into /t/ (e.g., *helped* or *asked*), /d/ (e.g., *opened* or *learned*), and /əd/ (e.g., *headed* or *listed*) words. As with the long vowel words, because the analysis was focused on the development of spelling of the past tense, words were classified only according to the *-ed* error (e.g., 'aked' and 'serfed' were scored as correct spellings for *asked* and *surfed*). For all three types of *-ed* words, the child's spelling was classified as *precommunicative* if few of the phonemes were represented and *correct* if the *-ed* was spelled correctly.

For the /t/ words, the spellings were categorized as follows: The spelling was classified as *semiphonetic* if it included an initial phoneme representation, some vowel representation, and a final 't'. The spelling was classified as *phonetic* if all phonemes were represented and the final phoneme was represented by a 't'. The spelling was classified as *transitional* if the root and past tense morpheme were both correctly spelled but without appropriate consonant doubling (e.g., 'stoped' for *stopped*) or with inappropriate consonant doubling (e.g., 'bakked' for *backed*). For /d/ words, the spelling was classified as *semiphonetic* if it included an initial phoneme representation, some vowel representation, and a final 'd', *phonetic* if the spelling was phonetically appropriate and ended in 'd', and *transitional* if the word was spelled as root plus *-ed* without appropriate changes to the root or consonant doubling (e.g., 'tryed' for *tried* or 'rubed' for *rubbed*). For /əd/ words, the spelling was classified as *semiphonetic* if it included an initial and vowel phonemes and ended in 'd', *phonetic* if it was phonetically accurate and ended in 'd', transitional if the root was inappropriately modified or inappropriate consonant doubling occurred (e.g., 'exitted' for *excited*).

The first two authors classified the words; a third researcher, blind as to the purpose of the study provided a reliability check; $\kappa = 0.99$ for silent *-e* long vowel words and 0.97 for *-ed* words (the probability of a chance agreement was set a 0.25 to account for the vast majority of the words being classifi-

able into only four stage categories; spellings that could be characterized as representing the prephonetic stage were virtually nonexistent).

The few discrepancies in scoring had to do with: (a) the phonological appropriateness of vowel substitutions for the vowel words, e.g., whether 'lak' for *like* represented a semiphonetic or a phonetic stage spelling (it was resolved as a semiphonetic stage spelling); and (b) how much of the root word had to be represented in order to be categorized as a past tense phonetic stage spelling, e.g., whether or not 'helt' for *helped* included a sufficient number of phoneme representations to be considered a phonetic stage spelling (it was resolved as such).

Results

Not surprisingly, the children's stories increased in length across grades, ranging from mean = 21.4 words (sd = 11.8) in first to mean = 155.9 words (sd = 71.7) in sixth grade. A repeated measures analysis of variance with grade as the between subjects factor and type of spelling (correct versus incorrect) as the within subject factor revealed expected main effects of grade [$F(5,204) = 36.01$; $p < 0.001$], and type of spelling [$F(1,204) = 594.77$; $p < 0.001$ (this and all additional effects involving a repeated measure of the dependent variable was evaluated using the Geiser-Greenhouse correction)]. The statistically significant interaction between grade and type of spelling [$F(5,204) = 44.14$; $p < 0.001$], was decomposed into a significant linear trend of increasing number of correctly spelled words [Scheffé $F(1,204) = 409.79$; $p < 0.001$], with no significant difference in number of words spelled incorrectly across grades. The mean number of incorrectly spelled words, collapsed across grades, was mean = 7.8 (sd = 6.2) words. Thus, although all children misspelled words, the ratio of correct to incorrectly spelled words increased across grades, with children spelling more and more of the words in their stories correctly as they progressed from first to sixth grade.

The majority of the misspelled words were unique; children were, overall, more likely to spell a number of words incorrectly rather than continually misspell a single word. Interestingly, if a child did misspell a word more than once, he or she was more likely to make the same error in the misspelling (e.g., continually write *Santa* as 'Sata' in a story with a Christmas theme) than to produce new errors (e.g., write *Santa* as 'Sata', then 'Sant', or 'Sana').

Evidence for stages?

Children's spelling was examined for two properties of stages (Flavell 1971), namely qualitative progression from stage to stage and concordance within

Table 4. Total number of words written (and number of misspellings)

Grade	Silent -*e*	/t/ Past-tense	/d/ Past tense	/əd/ Past tense
One	31 (21)	5 (5)	4 (4)	0
Two	59 (15)	10 (4)	18 (8)	4 (3)
Three	95 (16)	26 (7)	27 (8)	15 (2)
Four	130 (4)	27 (2)	52 (9)	14 (1)
Five	154 (2)	42 (3)	45 (5)	33 (0)
Six	169 (0)	31 (2)	59 (6)	29 (0)

a stage. Although the scoring system, developed in concordance with the developmental stages described by Gentry (1982) and others (e.g., Henderson & Beers 1980), includes a precommunicative stage of spelling, only a very few words were categorized as fitting into this stage. Thus, the precommunicative stage of spelling development is not included in any of the following analyses. Because not all children wrote all types of words, each word type is considered separately.

Silent -e long vowel words

Not all children wrote silent -*e* long vowel words; numbers ranged from a low of 20 first graders to all 35 fourth and sixth graders. The total number of silent -*e* words written by the children in different grades is shown in Table 4. The vast majority of silent -*e* words in all grades were single syllable, high frequency words, such as *home, made,* and *time.* Consistent with the increase in the number of words written across the grades, according to a one-way analysis of variance of words written as a function of grade, there was an increase in the number of silent -*e* long vowel words written [$F(5,172) = 11.04; p < 0.001$]. Tukey's post hoc analyses revealed that fifth and sixth graders included more silent -*e* long vowel words in their stories than did first, second, and third graders [HSD = 1.51, $p < 0.01$]. However, placed in the context of the overall number of words written, these words represented 7% of the words written by the 20 first graders and 3–4% of the words written by the other children; these differences were not statistically significant according to a one-way analysis of variance.

Because of the differences in number of words written, percentages were calculated for analysis of the different stages. Percent spellings classified as semiphonetic, phonetic, transitional, and correct were investigated using repeated measures analysis of variance with grade as the between subjects factor and stage as the within subject factor. There was a statistically signifi-cant effect of stage [$F(3,516) = 555.07; p < 0.001$], with the vast proportion
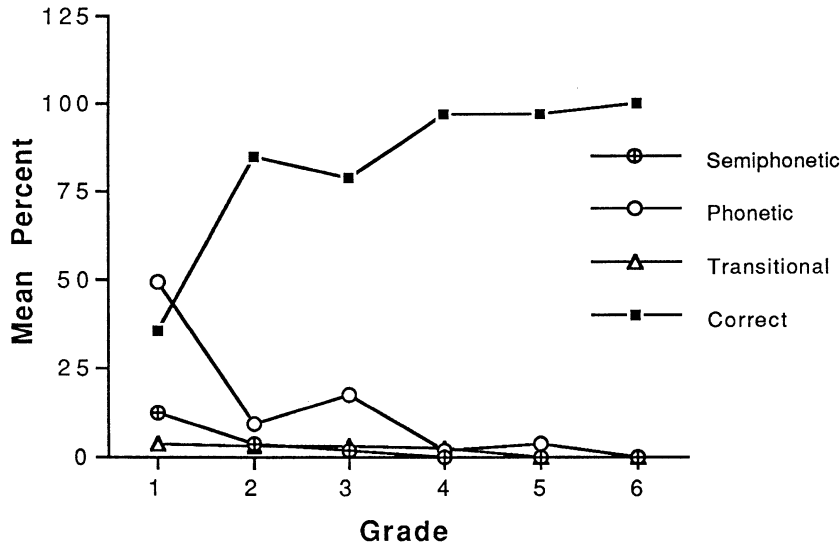
Figure 1. Stage classification for silent *-e* long vowel words.

of the words classified as correct (mean = 86% for correct versus mean = 2%, 11%, and 2% for semiphonetic, phonetic, and transitional stages); in addition, there were more words classified as phonetic than either semiphonetic or transitional [HSD = 7%; $p < 0.01$].

A developmental trend providing some support for developmental stage theory was evident in the interaction between grade and stage [$F(15,516) = 16.11$; $p < 0.001$]. The interaction is shown in Figure 1. The critical development appears to be a decrease in phonetic stage words associated with an increase in correctly spelled words from first to second grade. This difference was statistically significant according to a Scheffé post hoc analysis of the contrast-contrast interaction [$F(1,516) = 100.89$; $p < 0.05$].

Although the shift from phonetic representations of silent -e long vowel words to correct spelling is interesting, it does not exactly follow the pattern predicted by developmental stage theory. The predicted pattern would be one in which phonetic spellings (e.g., 'bak') are replaced by transitional spellings (e.g., 'baek') which, in turn, are replaced by correct spellings (e.g., 'bake'). In all cases, the phonetic spellings that were observed could have been spelled using a letter name strategy in which the medial vowel was represented by its letter name rather than with a silent -e. In addition, letter names were predominated for /e/ words (e.g., *bake, came*); 79% of /e/ words spelled by first graders contained this error (e.g., 'bak', 'cam') compared with 44% and 50% of /ai/ (e.g., 'tim' for *time*) and /o/ (e.g., 'hom' for *home*) words, respectively. A similar pattern was found with second graders; 22% of /ai/

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words contained a letter name error compared with 15% and 0% for /ai/ and /o/ words. No cases of representing the medial vowel with the letter name for the preceding consonant (e.g., 'km' for *came*) were observed.

Very few transitional spellings were observed, even in first and second grade where the developmental change occurred. Furthermore, the few transitional spellings differed across grades. The spellings classified as transitional in first and second grade consisted of representing the medial vowel with two vowels, such as 'caek' for *cake*, whereas the transitional spellings observed in third and fourth grades were more likely analogies to other orthographic representations of long vowels, such as 'wolk' for *woke* (e.g., *yolk*) and 'wight' for *white* (e.g., *right*). Thus, the transitional stage classification captured different errors at different grades.

Transitional children should also overgeneralize the silent -*e* rule, adding a silent -*e* on the end of words with a medial long vowel sound, e.g., spelling *wait* as 'wate' or *night* as 'nite'. We observed one silent -*e* overgeneralization by a first grader, seven (six different words) by second graders, and four by third graders. Only one of the overgeneralizations was made by a second grader who had spelled a word that was classified as transitional.

On an individual subject basis, there was also little support for a clear developmental stage progression. In order to examine the concurrence assumption, we examined multiple stage classifications for individual children to determine whether children were following the progression predicted by stage theory. A total of 27 children wrote words that could be classified in different ways. Many children wrote phonetic stage words as well as correctly spelled words (e.g., 'gav', 'lic', 'lake', 'line', and 'cane' for *gave, like, lake, line,* and *cane* written by a grade one child). However, there were a number of cases of multiple error classifications (e.g., 'whit' classified as phonetic, and 'woack', classified as transitional, for *white* and *woke* written by a grade three child).

Thus, in answer to the question, "Is there evidence for stages in children's spelling of silent -*e* long vowels?", we would answer "No, not really". There is a qualitative difference in spelling these long vowel words with a progression from phonetic to correct spelling occurring early in elementary school. Phonetic errors specifically consisted of letter name representations for the medial vowel and were more common for /e/ vowels. However, we did not find strong evidence for a transitional stage occurring between a phonetic stage and correct spelling; as well, the transitional errors we observed differed across grade, indicating that different transitional strategies may have been used by children in the different grades. These qualitative findings are inconsistent with developmental stage theory. In addition, individual children were not consistent in their spelling. The timing of the qualitative shift that we did observe appeared to be consistent with instruction; as shown in Table 2,

long and short vowels and the silent -e rule were reported to be taught in second grade.

Past tense words

The /t/, /d/, and /əd/ words were analyzed separately. This was because each of these types of regular past tense words has a different phonetic representation and somewhat different orthographic rules and/or conventions for correct spelling.

/t/ words. /t/ past tense words (e.g., *passed*) were written by more children in the higher grades, ranging from five and nine first and second graders, respectively, to 15–19 children in the higher grades. The number of /t/ words written by the children is shown in Table 4. A one-way analysis of variance revealed a statistically significant effect of grade on number of /t/ past tense words written [$F(5,76) = 2.58; p < 0.05$], with fourth graders (mean = 2.3 words) writing more /t/ words than first (mean =1.0) or second graders (mean = 1.1) [HSD = 1.2; $p < 0.01$]. Considering the increasing numbers of words written as a function of increasing grade, the /t/ words represented 5% of words written by first graders and 1–2% of the words written by the other children; the differences were not statistically significant according to a one-way analysis of variance.

Percent words classified according to stage was analyzed using a one between subjects (grade) by one within subject (semiphonetic, phonetic, transitional, and correct stage classification) repeated measures analysis of variance. There was a statistically significant difference between the different stages [$F(3,228) = 140.19; p < 0.001$]. Tukey's post hoc comparisons tests revealed that the proportion of correct words (mean = 83%) was greater than the proportion of words classified into semiphonetic (mean = 1%), phonetic (mean = 13%), or transitional (mean = 3%) stages; as well, the proportion of phonetic words was greater than the proportion of semiphonetic words [HSD = 11%, $p < 0.01$].

A statistically significant interaction was obtained [$F(15,228) = 11.26; p < 0.001$]. This interaction, most strongly depicting a gradual developmental trend of shifting from phonetic stage to correct spelling from first to fourth grade is shown in Figure 2. A Scheffé post hoc analysis of the contrast-contrast interaction of proportion of words classified as phonetic versus the proportion of words classified as correct from first to fourth grade was statistically significant [$F(3,228) = 41.80; p < 0.05$].

As with the analysis of silent -e long vowels, the developmental shift from phonetic stage to correct spellings without progressing through a transitional stage is not expected according to a stage theory description. One
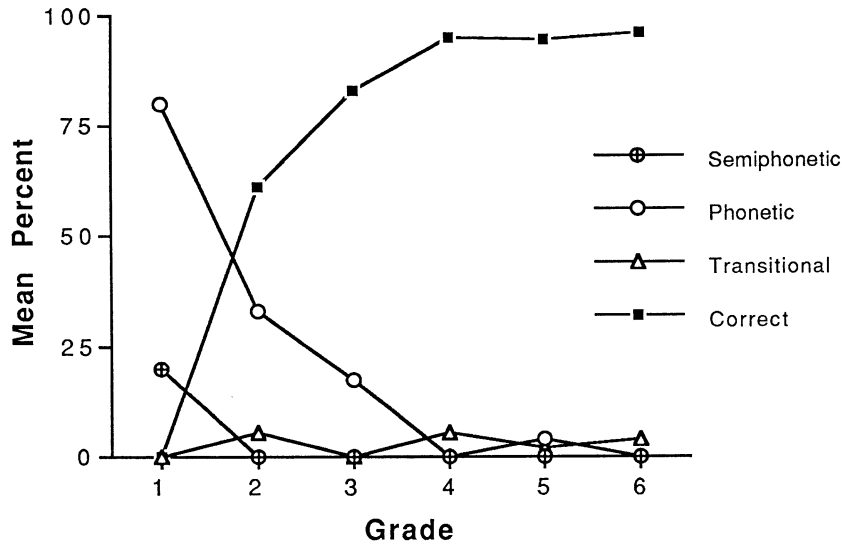
Figure 2. Stage classification for /t/ past tense words.

second, two fourth, one fifth, and two sixth graders produced transitional stage spellings. Each of these children made a consonant doubling omission error, e.g., spelling *stopped* as 'stoped'. One of the sixth graders made a similar error on a /d/ past tense word; the remaining children did not write other past tense words for which correct spelling required consonant doubling.

On the other hand, only a small percentage of /t/ past tense words required consonant doubling; across grades, then, 38% of the past tense /t/ words requiring consonant doubling were spelled according to the transitional stage without doubling, compared with 50% correct consonant doubling. No cases of overgeneralization of a consonant doubling, e.g., spelling *opened* as 'openned', were observed. Thus we found minimal support for a transitional stage for spelling /t/ past tense words: Consonant doubling omissions were observed as expected but expected overgeneralizations of consonant doubling were not observed.

Thirty-four third to sixth grade children wrote more than one /t/ past tense word. Seven children wrote words that could be classified in more than one way; these multiple classifications all mixed correct spellings with one type of error (e.g., 'bumped' and 'steped' written by a grade four child). These small numbers Emit assessment of the concordance property of stages with /t/ past tense words, except to indicate that individual children spelled some /t/ words correctly while making errors on others.

In conclusion, as with the silent -*e* long vowel words, the answer to the question "Is there evidence for stages in children's spelling of /t/ past tense

words?" is "No". There is a qualitative difference in spelling these /t/ past tense words; however, the shift from phonetic to correct spelling occurs more gradually, includes very little progression through a transitional stage, and is not complete until fourth grade. Again, however, the occurrence of consistently correct spelling coincides with the grade in which teachers report instructional emphasis within the spelling curriculum.

/d/ past tense words. /d/ words, e.g., *named*, were also spelled by more children in the higher grades; four first graders spelled /d/ words compared with 17 and 15 second and third graders, respectively, and 22–28 fourth through sixth graders. Mean number of /d/ past tense words written by the children is shown in the third column of Table 4. A one-way analysis of variance of number of words written as a function of grade was statistically significant [$F(5,105)$ = 5.77; $p < .01$], with sixth graders writing significantly more /d/ past tense words (mean = 2.7 words) than first and second graders (mean =1.0 and 1.1 words, respectively) [HSD = 1.2; $p < 0.01$]. Compared with the total number of words written, /d/ past tense words accounted for 5% of first graders' words and 1–2% of the words written by older children; these percentages were not statistically significantly different from each other.

Percent /d/ past tense words classified according to stage was analyzed using a one between subjects (grade) by one within subject (stage classification) repeated measures analysis of variance. There was a statistically significant difference between the different stage [$F(3,315) = 67.75$; $p < 0.001$], with percent correct words (mean = 77%) being greater than percent semiphonetic (mean = 1%), phonetic (mean = 18%), or transitional (mean = 4%) words; similarly, the proportion of words classified as representing the phonetic stage was greater than the proportion of words classified as semiphonetic or transitional [HSD = 12%; $p < 0.01$].

A statistically significant interaction was obtained [$F(15,321) = 5.87$; $p < 0.001$]. As with the /t/ words, the interaction between grade and stage classification for the /d/ past tense words, shown in Figure 3, appears to be due to the gradual decrease in phonetic stage spellings from first to fourth grade accompanied by a gradual increase in correct spellings. The Scheffé analysis of this contrast-contrast interaction was statistically significant [$F(3,321) = 17.14$; $p < 0.05$].

Once again, the developmental progression appears to be a shift from phonetic stage spellings to correct spellings without including a transitional stage. In general, the phonetic stage spellings consisted of the addition of *d* to the root morpheme, e.g., 'yelld', 'opend', and 'traveld' for *yelled, opened,* and *traveled.* A few phonetic errors resulted in homophones, e.g. 'aloud'
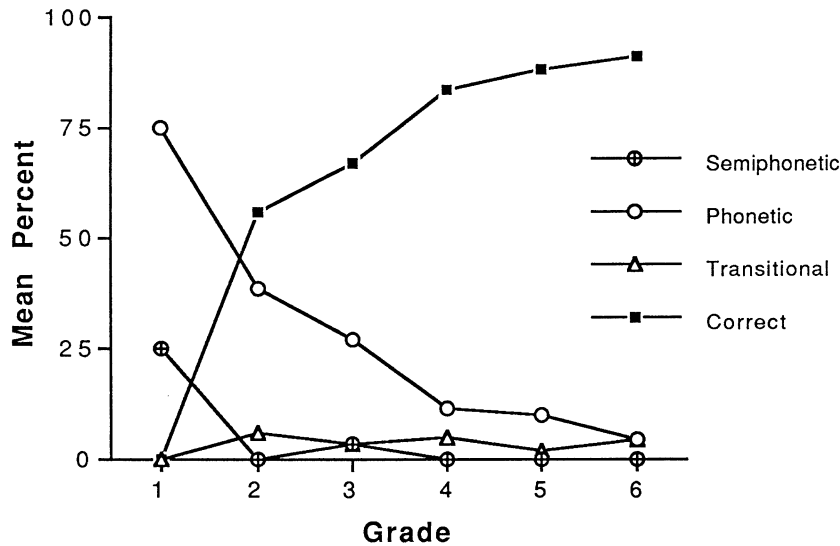
Figure 3. Stage classification for /d/ past tense words.

for *allowed*, or orthographically reasonable representations, e.g., 'prade' for *prayed*.

Even though a transitional stage could be easily identified for 48% of the /d/ past tense words the children wrote, few transitional errors were observed. For words ending in the letter, 'y', either the letter remains the same and the *-ed* morpheme is added, e.g., *stayed*, or the final letter is replaced with the letter, 'i', and *-ed* is added, e.g., *tried*. A transitional stage spelling for words for vowel-'y' words would involve replacing the 'y' with an 'i', e.g., 'staid' for *stayed*, representing overgeneralization of the transformation necessary for spelling consonant-'y' words; conversely, a transitional stage spelling for consonant-'y' words would be simply adding *-ed* to the root morpheme, e.g., 'tryed' for *tried*. No cases of overgeneralizing the 'ied' were observed; indeed, across grades, 81% of these words were spelled correctly. Only one case of spelling a consonant-*y* word as 'yed' ('tryed') was observed, the remaining words of this type were spelled correctly.

For words ending in consonants, the past tense morpheme is spelled with only the letter 'd', e.g., *named*. A transitional stage spelling of this type of word would be to rigorously apply the root plus *-ed* ending rule and add the *-ed* morpheme, e.g., 'nameed' for named, or to overgenerahze the double consonant rule, e.g., 'clossed' for *closed*. No cases of 'eed' were observed and the double consonant overgeneralization occurred only once, with a third grader, 88% of this type of /d/ past tense words were spelled correctly.

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A total of five transitional stage spellings were observed for the remaining words; two by fourth graders and three by sixth graders. Four of the transitional stage spellings were consonant doubling omissions (e.g., 'draged' for *dragged*) and one was a doubling overgeneralization (e.g., 'travelled' for *traveled*; note, however, that this is an acceptable – though not taught in school – alternative spelling). One fifth grader produced a transitional stage spelling for both a /t/ and a /d/ past tense, spelling 'stoped' for *stopped* and 'tryed' for *tried*; the strategy used was different for each of the words classified as transitional stage spellings, however. On the other hand, one sixth grader produced a consonant doubling omission for both a /t/ and a /d/ word, spelling 'droped' for *dropped* and 'grabed' for *grabbed*. None of the other children produced transitional errors for more than one type of past tense word.

Fifty six children wrote multiple instances of /d/ past tense words. The majority of these children wrote the words correctly or wrote mixed correct and single stage words (e.g., 'grabbed' and 'yelld'). Although only a few children made multiple stage errors (e.g., 'loved', 'arivd' and 'traveled'), even those who wrote multiple words classified in the same stage made inconsistent errors within that classification (e.g., 'playd' and 'plad' for *played*). Again, although there were relatively few words with which to assess concordance, there does not appear to be remarkable consistency in individual children's spelling of these words.

Overall, although there were more opportunities for transitional errors on the /d/ past tense words, the developmental progression was still not predicted by a stage theory account. In answer to the question, "Is there evidence for stages in children's spelling of /d/ past tense words?", we again answer "No"; as with the silent -*e* long vowel and the /t/ past tense words, the progression is from phonetic spellings of various sorts to correct spelling. This progression, occurring across first to fourth grade, is consistent with the instruction outlined in Table 2.

əd/ past tense words. Relatively fewer occurrences of /əd/ past tense words were observed; no first graders, four second, 12 third, 10 fourth, and 16 in each of fifth and sixth grade wrote /əd/ past tense words. The number of /əd/ words written is shown in the last column of Table 4. The number of words written by children in the different grades was not statistically significant according to a one-way analysis of variance as a function of grade. Compared with the total number of words written, only 1–2% of the words written were /əd/ words.

Proportion of words classified according to the different stages was analyzed in a one between subjects (second through sixth grade) by one within

subject (semiphonetic, phonetic, transitional, and correct stage classification) repeated measures analysis of variance. There was a statistically significant effect of stage classification [$F(3,150) = 214.03$; $p < 0.001$]. Tukey post hoc comparisons revealed that the vast majority of words were categorized as correct (mean = 94%) as opposed to semiphonetic (mean = 1%), phonetic (mean = 2%), or transitional (mean = 4%) [HSD = 11%; $p < 0.01$]. Unlike the other types of words, there was no statistically significant interaction between grade and stage categorization.

The only transitional stage spelling was produced by a fourth grader who wrote 'exitted' for *excited*. Overall, there is very little evidence for a stage-like developmental progression in spelling /əd/ words; we would answer the question, "Is there evidence for stages in children's spelling of /əd/ past tense words?" with "No"; the children have little difficulty spelling this type of past tense word correctly. However, the phonetic representation of many of these types of words would result in the correct spelling, likely accounting for the few semiphonetic, phonetic, or transitional stage spellings observed.

Discussion

The characterization of children's spelling as stage-like was critically examined according to two properties of stages. Neither children's spelling of silent -*e* long vowels nor their spelling for different types of -*ed* past tense words followed a strong developmental progression of qualitatively distinct stages from semiphonetic to phonetic to transitional to correct spelling across the elementary school period. Rather, the progression followed from errors representing the phonetic stage directly to correct spelling; furthermore, different rates in this profession appeared to be related to the spelling curriculum. On the other hand, multiple occurrences of a specific type of word were unlikely to have been classified into many different stages representing different types of errors. Thus, although many words were spelled correctly, concurrence in errors was generally obtained. However, given no empirical support for the qualitative change property and only minimal support for the concurrence property of developmental stages, we conclude that developmental stages do not adequately characterize the development of children's spelling ability in elementary school grades.

If not stages, then what?

Developmental stage theory is based on commonalities emerging from a feature analysis of children's spelling errors. For example, observations of children's use of a letter name strategy early on in spelling development

(many examples are cited in Read 1975; Gentry 1982; Ehri 1986) led Gentry (1982) to include this strategy as characteristic of the semiphonetic stage of spelling development. However, not all children use a letter name strategy and, of those children who do appear to use letter names in their spelling, they do not use the strategy on all words that could be spelled using letter names.

Furthermore, this letter name strategy may actually be a combination of strategies and different degrees of understanding about the phonological system, not a single approach used by children who only know letter names. Treiman (1994) analyzed the phonological features of letters that appear to lead children to use a letter name strategy, such as spelling *are* as 'r' versus spelling *tea* as 'te'. Different letters are more likely to be represented by their letter name in young children's spelling; how likely the letter name is used appears to be related to phonological properties of the letter name itself. Treiman (1994; Treiman & Cassar 1997) provided a much more elaborate description of children's use of the letter name strategy than provided by stage theory; furthermore, Treiman's account credits the young child with much greater knowledge and processing skill than the semiphonetic stage child is assumed to posses.

On the basis of naturalistic and experimental investigations of children's early spelling, Treiman (1994) proposed a three phase model in the use of letter names: A very young child, who cannot segment words much beyond the level of the syllable, might use a single letter to represent the sounds of the syllable, hence 'r' for *car*. This is similar to Gentry's (1982) consideration of the letter name strategy used by a child in the semiphonetic stage of spelling. As the child becomes better at phonological segmentation and analysis, he or she is able to separate out parts of a syllable; applying letter name knowledge to the rime of the word might then lead a child to spell *car* as 'cr'. This type of analysis would be beyond the capabilities of the semiphonetic stage child, who does not yet understand within-word orthographic patterns (Henderson 1990). Finally, when the child can segment out the /ar/ into /a/ and /r/, *car*. Although not tested longitudinally, Treiman's analysis of the phonological features of words that could yield a letter name strategy provides a more complete and likely accurate explanation of this development in children's spelling ability.

Our findings regarding differential errors on /e/ versus /o/ and /ai/ silent -*e* long vowel words support and expand Treiman's model. A relatively greater proportion of errors were made on the /e/ words, even though there are relatively fewer ways in which to represent the phoneme /e/ (e.g., c*ame*, d*ay*, r*ain*) than /ai/ (e.g., t*ime*, m*y*, h*igh*, f*ind*, m*ild*) or /o/ (e.g., h*ome*, b*oat*, gr*ow*, b*old*, m*ost*, n*o*) in a single syllable word. It may be that as children encounter a number of different orthographic representations for the same phonemes,

they begin to differentiate the appropriate representation of the phonemes. In the case of /e/, because there are fewer correct spelling patterns, the letter name strategy is a more salient possibility.

We also found many indications that the stage classifications of children's spelling are too broad to adequately describe spelling development. Incorrectly spelled words were almost exclusively classified as phonetic stage spellings. However, within the phonetic stage, the nature of the error was quite variable. These errors appear to be related to children's variability in phonological knowledge and strategy use. For example, *played* was spelled variously as 'plad' and 'playd'; the first error may represent a complete phonological analysis of the entire word whereas the second error appears to be a problem with representing the past tense morpheme. Similarly, misspellings of *cake* as 'kak' and 'cack' may represent different amounts of knowledge of orthographic regularity. All four misspellings, however, were classified as representing the phonetic stage of spelling development. Morris and Perney (1984) must also have recognized that the developmental stages were too broad; they expanded their prephonetic stage (a combination of Gentry's precommunicative and semiphonetic stages) into three substages in order to analyze spelling by children in grade one.

In addition, depending on the phonological properties of the word, different spellings can be classified as representing different stages of spelling development. For example, spelling 'stoped' is classified as a transitional stage error but spelling 'listed' is correct; similarly 'stopped' is correct but 'listted' is transitional. These examples bring into question the usefulness of stage descriptions of children's spelling.

The approach adopted by Treiman (1993, 1994), namely to identify an interesting development through naturalistic observation, then test out specific hypotheses through further observation and experimental manipulation, may be more profitable in the long run for understanding children's spelling development. It may be more important and useful to understand how children learn to recognize and represent morphemes in past tense words, in other affixed words, and in compound words than it is to be able to classify their strategy use across all these word types as phonetic, orthographic, or morphemic in nature. Concentrating on understanding how children develop, generalize, and modify strategic behavior within very small domains is likely to lead to a more accurate description of the development, leading to more specific developmental theory and more appropriate instruction.

This is the approach that has been taken by cognitive developmental researchers investigating the development of children's arithmetic (Siegler & Jenkins 1989). Researchers first posited a one:one correspondence between addition strategies and age, such that children at one age were characterized

as using one particular strategy and children at another age were characterized as using a qualitatively different strategy. Siegler and Jenkins (1989) summarized a good deal of evidence that children at all ages use a diverse range of strategies to solve addition problems. Their realization has generated a shift from conceptualizing children's cognitive growth as occurring in a stage-like fashion to describing and explaining variability in children's thinking and overlap in strategy use at different ages and on different tasks (Siegler 1994, 1995a, b).

Siegler (1995a) described this variability in strategy use in terms of overlapping waves. Over time, different strategies are developed and gradually increase in frequency of use. As other, more effective and/or efficient strategies are developed, they begin to predominate. The predominant strategy might be mistakenly identified as characterizing a particular stage of development, but it is not the only available strategy. Siegler's overlapping wave model very nicely describes the gradual change from phonetic to correct spelling shown in Figures 1 to 3.

Research on children's spelling development will benefit from the realization that children, from a very early age, use a variety of sources of knowledge and strategies in their spelling. In some sense, a number of stage theorists have begun to do this already. For example, Ehri (1992) has argued that stages of spelling development may be better defined in terms of sets of features rather than individual features. Templeton (1992) has outlined a system of instruction for older children based on derivational patterns in the English spelling system. These patterns (e.g., spelling *prediction* based on knowing the spelling for *predict* as well as understanding the nature of the suffix, *-ion*) integrate rather than distinguish phonological, orthographic, and morphemic aspects of spelling. This movement away from static, qualitatively distinct stages of spelling toward describing spelling in terms of the active development of interrelated knowledge and strategies needs to gain greater momentum in order to advance our cognitive developmental theories of children's spelling and to have a useful impact on instruction.

Instructional implications

Developmental stage theory of children's spelling has had an important impact on instructional practice. Morris et al. (1986) introduced the concepts of power and efficiency. Traditionally, spelling instruction has been based on how many words children spelled correctly; Morris et al. termed this spelling 'power' and argued that an emphasis on spelling power does not take into account children's developmental spelling level nor spelling 'efficiency'. They and others (e.g., Schlagal 1986, 1989; Morris et al. 1997) have provided compelling evidence, in the way of analyzing the quality of the children's

errors through a stage analysis, that there is greater diagnostic and prescriptive strength in considering more than simply number correct on a spelling test. However, as has been demonstrated directly in the present study and indirectly in other studies (Treiman 1992, 1993, 1994; Read 1971, 1975; Bruck & Waters 1990; Waters et al. 1988; Evans & Smith 1989), a stage description of children's spelling abilities is still too broad to have an impact on instruction.

Understanding children's spelling through a feature analysis approach provides more specific and potentially more appropriate instructional implications. For example, the stage description of the letter name strategy (Gentry 1982; Henderson 1990) and Treiman's (1994) more fine grained analysis of the knowledge and processing abilities that lead children to use the strategy have different implications for children's spelling instruction. Henderson (1990) provided exercises for teachers to use to teach children letter names so that they may use them in their spelling. Treiman (1994), on the other hand, would argue that, if they use the letter name strategy at all, teachers need to be sensitive to the phonological properties of the word that they are using when helping children spell using this early spelling strategy.

Most of the errors observed in this naturalistic study were classified as phonetic, hence Henderson's (1990; Henderson et al. 1985) exercises for helping children symbolize sounds with letter would be prescribed for many of the children. However, the likelihood of phonetic errors was quite variable, e.g., the relatively higher percentage of /e/ errors (e.g., for *bake*) than /o/ (e.g., *home*) and /ai/ (e.g., *time*) errors. In addition, the range of phonetic errors observed was extremely broad, such as 'cam', 'kam', and 'kaom' for *came*. Even when children made phonetic stage errors, they weren't necessarily consistent, e.g., the grade one child who wrote both 'brokc' and 'broke' or the grade three child who wrote both 'opend' and 'opened'. Clearly these children don't all need phonics instruction, or at least the same type of phonics instruction.

Experimental research needs to be done to examine children's spelling development of specific features, possibly combined with strategy reports and a longitudinal design, to determine when and how children learn spelling strategies that lead to the correct spelling of these types of words. Following identifying the types of knowledge children possess, then instruction can be developed that recognizes the children's sophistication while extending their understanding. For example, a child who writes 'listed' as well as 'opend' might benefit from instruction about the past tense form of verbs, including identifying the two morpheme words from a list of words ending in the same phonemes, e.g., *opened* versus *brand* and *yelled* versus *held*. This type of instruction, rather than simply providing more phonics instruction, builds on the wealth of knowledge that children have about the spelling system.

Conclusions

Children's spelling development, as investigated through their naturalistic writing, cannot be simply described as progressing through a series of stages. A stage description of children's spelling development is too broad and doesn't account for the depth of children's knowledge about the spelling system or for the variability in children's use of their understanding. Siegler (1994, 1995a, b; Siegler & Jenkins 1989) has argued that sophistication in cognitive developmental research is such that we are able to examine variability in children's development directly. Developmental research on children's spelling needs to be geared toward investigating the multiple strategies children have for spelling specific types of words and examining how children select among those strategies, as well as why and how children discover new strategies and modify old strategies as they attempt to master the English language spelling system.

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Note

1. The database is available in DOS and Macintosh FoxPro and ASCII formats. Please contact the first author to obtain a copy.

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