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Research in Spelling: Implications for Adult Basic Education

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Literacy has been likened to a societal currency (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). In this chapter, we consider how spelling ability might contribute to the value of that currency and the ways in which adult basic literacy instruction can support that contribution. Over the last few centuries, society has been increasing the value it places on accurate spelling, and spelling difficult words has now become a mark of a good education. Gerber and Hall (1987) noted, "The ability to spell is still imbued by an admiring public with connotations of studiousness, literacy, and intelligence" (p. 34). In the United States, the fact that we hold an annual National Spelling Bee in Washington, DC, attests to the cultural value that is placed on correct spelling, for its own sake, even today.

A recent study revealed that the perception, among their peers, of college students' writing ability and even of intelligence is negatively affected by the presence of a large number of spelling errors in a piece of writing (Kriener, Schnakenberg, Green, Costello, & McClin, 2002). Schramm and

Dortch (1991) found that even two misspellings in a resume substantially reduced the likelihood that a job seeker would be granted an interview. Accurate spelling is a criterion for employment even for blue-collar jobs. A cursory Internet search of position announcements, as well as of general information provided on the Web sites of employment agencies, showed that (a) various state agencies note accurate spelling as a criterion for many job postings, including entry-level positions, and (b) agencies that provide advice and assistance for job seekers note accurate spelling as a critical consideration in preparing cover letters, applications, and memos. One agency describes spelling ". . . as a reflection of one's competence and commitment to quality" (http://www.employmentreview.com).

A needs-assessment survey of adults with low literacy skills found that 65% cited spelling as a significant problem in their lives (Hoffman et al., 1987). The results of this survey suggest that spelling instruction should be a specific component of the curriculum in ABE classes. Proficient spelling does appear to contribute to enhanced workplace opportunities as well as to self-actualization.

This chapter reviews the research about spelling (related to K–12 and adult students).[1] The research base contributes to our understanding of spelling as a skill having personal and social value, as a language-based process that follows a developmental path, and as a curricular component within adult literacy education. We then discuss the implications of the research for adult literacy education practice, policy, and further research.

SPELLING INSTRUCTION IN HISTORICAL PERSPECTIVE

Throughout much of the early history of the United States, spelling instruction was inextricably bound to reading instruction. In the early colonial period, children learned letter names first, then learned to spell and pronounce letter couplets, syllables, and multisyllable words. Spelling was not intended to teach meaning, and accurate spelling, in and of itself, was the desired goal.

It was not until the mid-1800s that critics began attacking spelling instruction for failing to give attention to word meaning as well as accu-

[1] It is necessary to include K–12 research because there is very little research on spelling of low-literate adults. Much of the adult research discussed here relates to low-literate, rather than proficient, adult spellers.

racy of spelling. These critics believed that spelling should serve written communication and, therefore, it was important to recognize and understand the meanings of words one could spell. During the mid-to-late 1800s, several vocal advocates called for the reform of English spelling. In the main, they proposed altering the alphabet or creating an entirely new alphabet (Balmuth, 1982). Within this movement, Dr. Edwin Leigh's efforts are noteworthy—he might be considered the father of the phonics approach to spelling instruction. Leigh modified letter features to cue different pronunciations. For example, the soft sound of *TH* (as in *thin*) might have a line drawn through it to visually cue the distinction of the soft sound from the hard or voiced sound of *TH* (as in *they*). The program developed by Leigh retained conventional spellings but, for the first time, the sound a letter represented, not its name, was the entrée to reading and spelling words. The sound of each letter was pronounced and then blended together to produce the word. For example, when seeing *CAT* the child now pronounced the sound of each letter */kuh/-/a/-/tuh/* and blended or fused these sounds into the complete word */cat/*. Similarly, when spelling a word that was pronounced orally, the child first isolated the individual sounds and then coded each sound with the appropriate letter or combination of letters.

During the first half of the 20th century, advocates of spelling reform in the United States focused on development of a functional spelling vocabulary by identifying specific words to teach and determining when (in what grades) to teach them. Choosing which words to teach was rooted in the frequency of their occurrence in the writing of children and adults (Hodges, 1977).

In the latter half of the 20th century, research in the field of linguistics began to reveal that English orthography (the spelling patterns) represented logical and predictable relationships rooted in semantics (word meaning) as well as phonology (speech sounds). Extensive research conducted within this linguistic framework supported the conclusion that English spelling represented a morphophonological system, wherein the letter symbols relate to the speech units of the language but the structural or meaning units (e.g., roots and affixes) determine spelling and pronunciation—the words look similar even if they are pronounced differently (Crowder & Wagner, 1992). Subsequently, as an outgrowth of extensive research conducted in the McGuffey Reading Clinic at the University of Virginia, an approach to spelling instruction was developed that elucidated three layers of information in the spelling system: the alphabetic or letter–sound layer; the pattern layer (which links variant spellings of a sound to its position

in a syllable); and the meaning layer (which links the spelling of different words that are related in meaning, such as *human* and *humane;* Henderson & Templeton, 1989 as cited in Templeton & Morris, 2000). Teachers using this approach initiate instruction with letter–sound associations, use word sorting to help students recognize different ways (patterns) to spell some sounds (i.e., different spellings of the long sound of *"e"* as in *beet, meat, key, believe*), and teach how spelling patterns are used to inform pronunciation (e.g., *stop, stopping* where doubling the consonant preserves the short sound of the vowel; *mine, mining* where dropping the *e* and adding *ing* maintains the long vowel sound, as well as meaning).

In the latter decades of the 20th century, educational theorists were divided in their opinions of the "best" way to develop skill in reading and spelling. Generally speaking, the advocates of various approaches could be separated into two camps—those advocating "bottom-up" approaches and those advocating "top-down" approaches. Bottom-up approaches emphasized learning about print features as they relate to sound and meaning. Letter–sound approaches (phonic rules) and word-family (analogy) methods are illustrative of the bottom-up approach to both reading words and spelling words. Top-down approaches focused on the learner's knowledge about the world as each learner interacted with the orthography to communicate through print. The goal of reading was to construct meaning by drawing on one's own reservoir of experiences that could be related to the text created by the author. The principal focus of writing was on the content of the message. Among beginning spellers, for example, teachers' acceptance of "invented spelling" encouraged students to create their own ways to spell so that they were free to focus on the meaning and message, rather than on form. In invented spelling "kak" would be an acceptable rendering for "cake" or "cr" for "car," as these spellings preserved the sequence of sounds as well as a reasonable representation of letter–sound correspondence. Therefore, it was possible for a reader (the teacher or another student) to decode the intended message. In time, the beginning writer was expected to recognize that the spelling he or she used for a given word was different from that used by others—in books, on charts, when reading the work of others in the class—and would adopt the standard form.

This brief overview of spelling instruction in the United States since colonial times reveals a repeating cycle of debate and change. Successive changes have served to bring instruction more in line with the functional utility of accurate spelling. Only recently, however, has debate spawned research that places the learner and the learning process at the core of the issues being debated. The next section reviews research that addresses

different theories to account for the underlying mechanisms that support proficient spelling, as well as those that attempt to explain how one learns to spell.

Becoming Proficient in Spelling

Rote memorization was the dominant approach to learning to spell throughout much of U.S. history because the way words were spelled was considered illogical and unpredictable. In the latter half of the 20th century, the field of linguistics ushered in a new view of language as a highly regular, rule-governed system (Chomsky, 1968; Chomsky & Halle, 1968). In this view, the language learner did not learn by imitating adults. Rather, the learner, in a rich language environment, actively abstracted rules about the structure and organization of language and applied them in novel situations. A child's progress in learning the implicit rules that guide the formation of sentences or word forms could be inferred from the errors made in production. For example, a child who used *goed* for *went* or *runned* for *ran* was applying the regular rule for forming past-tense verbs, but had not yet recognized or internalized irregular forms. In this context, Read (1975) analyzed the spelling attempts of young children and concluded that their spelling "inventions" reflected their current knowledge of the orthography and the rules that had been abstracted about the spelling system. For example, if "kk" is used to spell "cake," we can infer that the child has isolated two separate sounds in the word but that there is still some confusion about the distinction between letter names and letter sounds when coding the separate sounds. The letter name is used to code the first sound the student isolated, /kay/, but the letter sound associated with the same letter was used to code the second sound, /kuh/. Knowledge of the orthography is still emerging ("c" and "k" can both code the /kuh/ sound), while knowledge of a basic spelling rule (a vowel appears in every word) has not yet been abstracted from involvement in literacy acts. Sawyer (2003, personal observation) saw a similar example. An adult with very low literacy skills spelled "ruin" as "run." Here, the first syllable was coded correctly, but the letter name for "n" was used to code the last syllable /en/ (the student pronounced the word as "roo-en").

In the latter half of the 20th century, the field of cognitive science was focusing on the underlying mental processes that account for or explain behavior. Learned behavior was assumed to involve a process of abstracting information from experience that was then consolidated into general rules or logically derived plans for behavior. Work in linguistics and

cognitive science converged, resulting in a definition of the learner as an active participant in developing an understanding of his environment and in interacting within it. From these two fields, four principal theories of spelling emerged. Two—dual-route theory and connectionist theory—attempt to describe the mental processes underlying proficient spelling. Two others—stage (or phase) theory and constructivist theory—attempt to explain how skilled spelling develops over time. In an attempt to assess the viability of a given theory, researchers often conceptualize a model or hypothetical flow diagram that specifies the elements of the theory and how they would relate if the theory were to be supported. Research studies are then designed to determine if the functions and relationships essential to the theory can be supported with evidence gleaned from these studies. Models provide a vehicle for testing the validity of a theory.

No theory has yet fully explained the mental processes involved when we spell a word, or has described how we acquire the ability to apply those processes. However, a substantial body of research is associated with each of the theories and this permits consideration of the relative value of each for spelling instruction in ABE classes.

Dual-Route Theory of Efficient Spelling. The dual-route theory assumes that two separate and independent routes to storing and retrieving information are essential for spelling (Coltheart, 1978). The phonological route involves establishing and recalling the association or correspondence of sounds, letter clusters, and syllables with graphemes. The orthographic route involves direct access to lexical units (whole words in a mental dictionary) stored in memory. Dual-route models are descriptions of what and how each separate route contributes to correct spelling. Such models propose that, to spell words following regular letter–sound spellings, people tap into the phonological route. However, the direct lexical access route is used to spell irregular words. Over time, and with much experience with written language, the orthographic representations of many more words come to be stored in a personal lexicon—a mental dictionary. In other words, through the process of learning, words that were originally accessed via phonological processing may subsequently be accessed directly through the orthographic route. Direct access to the lexicon permits faster reading and more fluent spelling, bypassing the time-consuming process of converting sounds to letters and letter sequences. The phonological route places a heavy load on phonological processes including phoneme awareness, sound sequencing, and auditory memory. The lexical route puts the burden on visual memory.

Leong (1998) specifically tested the relative contribution to spelling that was derived from strategies that tapped into each route. One hundred and fifty students in Grades 3 through 6 were given lists of words to spell. Some words were phonologically regular (could be spelled by mapping each sound to a letter or common letter cluster) but others were not. Leong concluded that each route was equally important in achieving accurate, efficient spelling. He recommended that teachers deliver explicit instruction in both phonological and orthographic structures in order to develop the connections between phonologic and orthographic segments essential for effective spelling. Similarly, in a longitudinal study of spelling (in Grades 1 through 4), Wagner and Barker (1994) found that children's spelling of nonsense words reflected the joint influences of orthographic and phonological knowledge (such as remembering to code a long vowel sound in a word using a final *e*) as well as of phonological memory (coding all the component sounds present in the word). Individual differences in early spelling performance could be attributed to differences in phonological awareness (including the ability to isolate all sounds in a spoken word and retain the sequence while writing the letters to represent those sounds) that were constant across developmental levels from Grades 1 through 4. Nonsense words provide a unique window on spelling skill for they force the speller to draw on general knowledge of the orthographic and phonologic structure of pronounceable syllables that is independent of specific words they have learned to read or spell previously. Wagner and Barker concluded that both phonological and orthographic knowledge affect spelling performance among normally progressing students and that these systems are integrally related.

Weekes (1994) identified proficient adult spellers who demonstrated a preference for the lexical-access (visual) strategy when reading single words. Adults showing this preference generally recognized the words quickly and did not resort to sounding them out. Weekes then examined their spellings of regular, nonsense, and irregular words. These adults were superior to nonlexical (phonological) readers when spelling irregular words (words that do not adhere to the one sound, one letter pattern) and about equal to nonlexical readers on nonsense-word spelling (nonsense words generally adhere to common letter–sound associations). This finding was not expected as one would anticipate that users of the phonological strategy would have the advantage when spelling nonsense words because nonsense words have not been previously seen or read and cannot be stored in a personal lexicon. Weekes suggested that this, and earlier studies he cited, lends support to the basic assumptions of the dual-route

theory of normal spelling because lexical readers were efficient in the use of both visual and phonological routes when spelling. However, it has been documented that unfamiliar words can be, and often are, spelled by referring to a known word that contains a similar sounding chunk. For example, if one knows how to spell "pant," it is relatively simple to generalize from this to the correct spelling of the nonsense word "zant" if the letter–sound correspondence for /zz/ is well established (Goswami, 1988).

Kamhi and Hinton (2000) reviewed a host of studies of spelling development and concluded that poor spellers follow a different developmental path from good spellers. They rely on visual strategies, remembering how words look rather than how sounds are spelled, and that reliance on visual strategies is a consequence of limited phonological knowledge. When we consider adults in ABE classes, limited phonological knowledge might arise from previously limited educational opportunities. However, such limitations may also be present due to cognitive processing deficits. That is, speech sounds may be coded imperfectly in memory, making it difficult to map a letter or letter-string onto a phonemic unit reliably (e.g., confusion of f/th sounds in phonological memory can affect the spelling of words such as "deaf" for "death" or "thin" for "fin"). The review provided by Kamhi and Hinton (2000) raises two important issues for adult literacy providers concerned with developing skill in spelling. First, reliance on memorizing the spelling of specific words can promote reliance on visual cues and word-specific knowledge. This is a relatively inefficient strategy because memory cannot support retention of all the words one needs to learn to be effective in written communication. Second, many adults with language-based learning disabilities have inefficient phonological processing systems and poor phonological memory. Therefore, it would seem that effective instructional approaches in ABE classes must seek to maximize interactions among the visual and auditory systems. For example, words identified for spelling study might be used in a sentence, meanings and possible synonyms discussed, and phrases in which the words commonly appear might be elicited and written on the board and in notebooks with the target word underlined or highlighted. The target word might then be spelled aloud as each letter is written on the board and in the notebook. Students might then write a phrase or sentence that helps to fix the use of the word in memory.

Fischer, Shankweiler, and Liberman (1985), in a study of college students, concluded that poor spelling was due to failure in acquiring the generalizations that describe the regularities of English spelling at all levels—phoneme, morpheme, and derivational, that is, forms derived from a root

such as *skate* to *skating.* Such regularities apply to conversion rules (rules that govern the relationship between sounds in spoken words and the way letters are used to code those sounds—coding a long vowel, plural forms, past tense forms, etc.) and thus emphasize the role of the phonological route. Interventions that might flow from these conclusions would logically focus on enhancing phonological knowledge—phonological awareness and phonics. For example, Kitz and Nash (1992) reported that training college students who were poor readers to use letter–sound spelling strategies resulted in improved reading rate, comprehension, and spelling.

Holmes and Ng (1993) conducted a series of experiments involving spelling among college students that led to a very different set of conclusions. In those studies, the greatest difference in the spelling performance was that good spellers were more familiar with low-frequency words that were almost exclusively dependent on word-specific knowledge (e.g., *bourgeois*) learned by rote. Poor spellers in these studies also appeared to have less reading experience (exposure to words in print). However, differences between the groups were explained not in terms of reading experience but in terms of failure to attend to and use all of the cues available when reading a word (a partial-analysis strategy). The researchers concluded that this failure to process all available cues when reading placed limitations on the information that was accessible in their lexicon to support spelling.

Burt and Fury (2000) built on the work of Holmes and Ng. They assessed and compared spelling, vocabulary, reading comprehension, reading experience (inferred from a student's recognition of the author of popular books), and reading accuracy for a sample of 100 university students. They found that reading experience and word reading accuracy (evidence of direct recognition of a word stored without resorting to decoding) contributed to the prediction of spelling performance, above and beyond the contribution of reading comprehension and vocabulary. This finding was consistent with earlier work (Cunningham & Stanovich, 1990) that examined these skills among middle-school students. Cunningham and Stanovich concluded that spelling is rooted in word-specific knowledge and that their study suggests the preeminence of a single route for spelling, rather than a dual route, because greater experience with whole words through reading appeared to give rise to better spelling performance.

Taken together, the findings of the studies reported here suggest that efficient spelling draws on competencies in both the phonological and orthographic systems and that poor spelling may result from limitations in either or both systems.

Connectionist Theory of Efficient Spelling. Connectionist theory holds that the lexical and phonological systems interact. Limitations in the phonological processing system affect one's ability to establish associations with the orthography. It is widely accepted that awareness of the sound structure of language—including skills of rhyming, blending, and segmenting syllables and phonemes in words—is essential for establishing the conceptual link between letters and sounds (the alphabetic principle; National Reading Panel Report, 1998). Van Orden, Bosman, Goldinger, and Farrar (1997) suggest that the strong connections between letters and phonemes explain why the majority of spelling errors are phonologically acceptable. Accurate spelling requires that one generate letter sequences out of phonologic and semantic data. In English, the sound-to-spelling relationship is relatively complex. Thus, reliance on phonological data permits several spellings for the same sound unit (e.g., *rows, rose*). Connectionist models (designed to describe and document interactions between the two systems) focus on the associations between phonology and orthography (Seidenberg & McClelland, 1989). These models describe learning as the adjustment of connection strengths between an actual pattern of activity (e.g., a spelling error) and a target pattern (e.g., accurate letter–sound association or the association of letter patterns with meaning).

Ehri (2000) describes such connections in her work. She used the term *amalgam* to explain how the spelling of a word is remembered:

> When readers see and pronounce words, their knowledge of the alphabetic system is activated and computes connections between graphemes in the spellings and phonemes detected in the pronunciation of the words. Repetition of this process a few times bonds the spelling of the word to its pronunciation and meaning in memory, forming an amalgam. (p. 22)

Ehri makes two important points: (a) reading and spelling are closely related processes and probably should be integrated for instruction, and (b) strengthening connections between the pronunciation and spelling of some irregularly spelled words by exaggerating the pronunciation to match the spelling (e.g., pronounce the *t* in *listen*) will better fix the visual form in memory. The latter point receives some support from a study by Dietrich and Brady (2001). They found that adult poor spellers more often misspelled words that they mispronounced. This suggests that poor phonological representations in memory, resulting from mispronunciations in normal speech, may contribute to poor letter–sound knowledge, which then results in misspellings. This conclusion is consistent with that of Kamhi and Hinton (2000), who attribute spelling that relies on memory of the way a word looks to limitations in phonological knowledge.

Read and Ruyter (1985), in their study of 50 men with low literacy skills, were able to better define the precise aspects of phonological processing deficits (knowledge about phonology) that interfere with the development of strong associations between letters and sounds. When performance on a number of tasks was compared to that of normally achieving children reading at the same grade levels as the men, the men were found to have poor phoneme segmenting skills and short-term memory. They did better than children when reading and spelling exception words—those rooted in experience with the orthography (e.g., *court, anxious*)—but much worse when decoding and spelling nonsense words (e.g., *nath, frug, phong*)—tasks that are dependent on phonological processes. The use of sound-to-spelling strategies was barely evident. The authors concluded that these men could not create and maintain an accurate phonological representation of a word in memory, analyze it into phonemes, and relate these to spellings beyond the beginning of a word. Due to the fact that they were adults, the authors conclude that phonological processing deficits in the study subjects cannot be attributed to a slower rate of development (maturational lag). One could not expect that these skills will develop naturally, with time. Thus, direct instruction would likely be necessary to address these deficits.

In their review of literature on learning to read, Perfetti and Marron (1995) concluded that training in phonological awareness is an appropriate beginning point for adults across a wide range of literacy skills, including spelling. They proposed that this training must be combined with direct instruction that builds on the alphabetic principle (understanding that speech sounds link with letters of the alphabet to spell a word) if instruction is to be effective.

In their series of three studies of spelling among university students, Holmes and Caruthers (1998) offered a somewhat different explanation. They maintained that, among normal readers, there is a common representation that underlies both reading and spelling. Because the subjects in their studies (the sample sizes ranged from 44 to 97) could read words they could not spell correctly, the authors concluded that a partial-cue strategy could support recognition but not production. Stated another way, the students gathered sufficient graphic cues through reading experience to recognize a word in print but did not input sufficient visual details or features of that word to establish fully specified networks of grapheme–phoneme connections that permit the detailed rendering required for accurate spelling. In this situation, spelling must rely more on how a word sounds than how it looks. Unlike the men in the study by Read and Ruyter, the students in this study evidenced the ability to create a strong phonological

representation for words in memory. However, this was not sufficiently well supplemented with a store of visual details to support accurate spelling of exception words—those words that are not spelled as they sound (e.g., *love, chief, social,* etc.). Why the phoneme–grapheme representations might not be well established is open to interpretation. Could it be the result of limitations in the phonological processing system, in cursory visual analysis of print features, or in amount of attention required to integrate the two systems? This issue has relevance for instruction but has yet to be resolved.

Embedded in connectionist theory is the concept of spelling by analogy (Goswami, 1988; Nation & Hulme, 1998). This involves spelling unfamiliar words based on a part shared with a known word. For example, if one can pronounce and spell *cat,* one can use that knowledge to spell *rat, brat,* and even *attic.* Nation and Hulme (1998) found that even 6-year-olds could use this strategy if phoneme–grapheme correspondences were fairly well established. In a related study, they found that children who were skilled at segmenting phonemes in a word were more likely to use the analogy strategy when spelling than were those with less well-developed segmenting skills.

We can infer from research related to models of connectionist theory that learning to read and spell are probably mutually facilitative and that acquiring the underlying networks of association between spoken and written language requires many experiences to cement the auditory and visual representations for words, as well as the linkages between them. Then, a massive amount of practice is required to extract the regularities and to establish stable encoding behavior. In the course of normal development, extensive involvement in reading and spelling activities is generally sufficient to support such learning. However, when students continue to struggle, a more direct approach may be useful. One approach that has been suggested as especially facilitative of this learning process is the multisensory teaching method. In this approach, all senses are brought to bear in acquiring letter–sound correspondences, sound–spelling patterns, and spelling–meaning structures in simultaneous reading–spelling instruction programs. Although there is little research that examines the efficacy of such programs (see Fulk & Stormont-Spurgin, 1995, for a review), reports of clinical studies suggest they are effective in addressing the needs of students with learning disabilities (International Multisensory Structured Language Education Council, 1995). Successful applications of multisensory teaching programs have also been reported for adults with low literacy skills (Post, 2000), college students who are poor readers and

spellers (Wilson, 1998), at-risk high school students (Sparks, Ganshow, Pholman, Skinner, & Artzer, 1992), and learning-disabled delinquents (Simpson, Swanson, & Kunkel, 1992).

Stage or Phase Models of How Spelling Is Learned. Stage models are related to dual-route theory but build on the Piagetian theory of cognitive development. Piagetian theory holds that qualitatively different skills characterize successive stages of cognitive development. Stage models seek to describe the qualitative differences that develop as complex skills are acquired. When applied to the acquisition of reading and spelling, stage models describe a learner's progress through stages of knowledge about the orthography and how this knowledge relates to the phonological system. At each stage, the learner constructs rules to organize and define the regularities embedded in the orthography.

Frith (1980, 1985) proposed a phase or stage model of reading and spelling development that describes three hierarchical levels of competence essential to support the acquisition of literacy: the logographic phase, the alphabetic phase, and the orthographic phase. In the logographic phase, children use visual cues and symbols to read and spell (e.g., drawing a heart to say "I love you," or recognizing a favorite cereal by the color or pictures on the box). Children might recognize whole words by their shape or special letter features. Adults who function at this stage (those at Level 1 or beginning English-language learners) recognize traffic signs, packaging logos, and the like, but do not always recognize the printed words within these materials when they are presented independent of the full context.

Frith characterized the alphabetic phase as representing a shift from primarily visual cue use to learning a phonological recoding system. In order to support the transition into this phase, refinement of phonological awareness skills—rhyming, blending, phoneme segmentation—is critical. As noted previously, the ability to segment the separate sounds in a word is considered essential in order to establish sound–letter mapping and phoneme–grapheme sequencing for spelling production. Frith suggests that reading and spelling at the alphabetic phase primarily involves sequential recoding (letters to sounds; sounds to letters) of words where there is a one-to-one match between letters and sounds (e.g., the sounds, /p/-/i/-/n/ may be spelled using the letters p-i-n). At this stage, words such as "late," which require knowledge about the final *e* rule to change the sound of the vowel, would not be consistent with the student's knowledge about how the orthography works to cue the representation of a sound. The work of other researchers lends support to Frith's hypothesis regarding

the importance of phoneme segmenting and letter–sound coding at this stage of literacy acquisition. Ehri and Wilce (1987) found that students who could not decode words learned to read more words when they were trained to spell words phonetically than when trained to use letter–sound associations only. That is, among children who were nonreaders, those who were taught letter–sound correspondences as they learned to spell words (e.g., *man* = /mm/-/a/-/nn/) were able to read untaught words more readily than those who learned individual letter–sound pairings (e.g., /m/, /f/, /a/, /p/, /n/) and were asked to apply that knowledge to reading words containing those sounds (e.g., *man*). Segmenting and coding phonemes (oral to written representations) was a superior strategy for learning to read words. Share, Jorm, MacLean, and Matthews (1984) found that the two best predictors of reading achievement after 1 year of instruction were letter-name knowledge and phoneme segmentation measured before instruction. Similarly, Greenberg, Ehri, and Perin (1997) found that adults in literacy classes, matched for reading level with third, fourth, and fifth graders, were severely deficient in phonological processing (phoneme segmenting and deletion) and that this contributed to limitations in reading and spelling words. Spelling was the weaker skill among adults, due to weaker integration of knowledge about word reading with knowledge about spelling.

In the orthographic phase, Frith (1980, 1985) suggests that reading and spelling require a shift from primarily phonological recoding to the integration of phonological and orthographic knowledge. Grapheme–phoneme correspondences are consolidated into patterns that occur across words (e.g., the final *e,* multiletter blends, morphemic units that mark number or tense, etc.). Patterns of letters become part of the generalized knowledge of how sound and meaning are accounted for in the English spelling system. A study by Lennox and Siegel (1996) lends support to this shift in focus. Average spellers showed little gain in phonological task scores after fifth grade but visual task scores improved dramatically. In contrast, poor spellers continued to show gains in phonological scores beyond fifth grade and scores in visual tasks remained low. Poor spellers had less well-developed phonological skills, early on, to support spelling and were slow in shifting from a letter–sound strategy to a more efficient spelling pattern strategy.

Other researchers have also proposed stage models of spelling (Gentry, 1981; Henderson, 1985). Henderson further differentiated the phases proposed by Frith (into five rather than three) and more fully specified the hierarchy of concepts that must be learned and consolidated in order

to move from one stage to the next (Ehri, 1994). Detailed descriptions of the skills hierarchy supports both diagnostic assessment—to determine where on the continuum instruction should focus—and identification of the specific skills and concepts that must next be developed. Bourassa and Treiman (2001) reviewed recent literature on spelling development and spelling disabilities. Within the general framework of a three-stage model, they conclude that spelling disability might arise as a consequence of incomplete mastery of skills (e.g., phonological awareness, awareness of letter forms and names) and knowledge (e.g., orthographic and morphological rules) at any stage. They urge fine-grained analysis of spelling errors to determine differences between normally developing students and those with spelling disabilities to identify the focus for remediation.

Fresch (2001) applied a stage-model approach to interpret data collected during a longitudinal study involving one child's journal entries from kindergarten through fourth grade. These entries provided a window on the child's developing knowledge. Fresch found that the spontaneous spelling productions could be characterized, from kindergarten through third grade, according to the hierarchical five-stage model (Henderson, 1985) of knowledge about word structure. She suggests that journal entries are a source for analyzing students' word knowledge, planning individual instruction, and assessing progress over time.

Within the conceptual framework of stage models of spelling acquisition, learning to spell has been described as a process of moving from spelling to represent sound to spelling to represent meaning (Templeton, 2002). To assess where on this continuum a student's skill development might be, Ganske (2000) designed lists of words to permit an inventory of concepts about spelling that span the process continuum. Such an inventory permits direct teaching of the specific concepts each student is ready to learn. To help students learn the critical concepts necessary for success at each stage, researchers at the University of Virginia developed activities that involve sorting and categorizing words by features of sound or meaning to help students discover the rules that relate letters and letter sequences to sound and meaning (Bear, Templeton, Invernizzi, & Johnston, 2000). For example, one group of students might receive a set of words that require sorting according to categories that will help to support recognition of different ways to spell the long *a* sound (final *e, ay, ai*). At the same time, another group may be working on sorts that reveal distinctions in the sound of a vowel within open or closed syllable patterns (e.g., *ma-ple* vs. *mat-ter*), while a third group is working on sorts to reveal the effect of adding "*ing*" to words ending in a consonant or in final *e.* During the sorting activity, the

teacher can observe the ease or difficulty of the task for each student and ask questions to assess a student's ability to articulate a generalization discovered through the sorting task (e.g., doubling a final consonant before adding "*ing*" is necessary to preserve the short sound of the vowel). In this way, the teacher can determine which students need more practice, as well as who may be ready to move on to learning a new concept. Word-sorting activities provide the means to effectively individualize instruction within a group of students and to chart individual progress.

To examine the utility of a stage-model approach in adult literacy classes, Bear, Truex, and Barone (1989) used a spelling inventory to determine the stage of spelling development of 32 adult students. They wanted to determine if the developmental sequence observed among children would hold for adult learners. Additionally, the researchers wished to determine how well a spelling inventory worked, compared to a word-recognition measure, in determining level of skill attainment. A strong correlation was obtained between spelling scores on the inventory and word-recognition scores. However, word-recognition scores offer insights into the grade level of material that might be used for instruction, but not what skills to specifically teach. The spelling inventory provides an entry point for systematically expanding students' knowledge about word structure to improve both reading and spelling. The authors concluded that adult spelling development follows a pattern similar to that observed in children and that assessment of spelling stage is a useful tool to differentiate instruction for clusters of students in adult literacy classes. Two other studies also support the conclusion that adults and children follow the same developmental path toward correct spelling. Viise (1995) and Worthy and Viise (1996) examined the spelling errors of adult literacy learners and elementary students, matched for achievement. Both groups demonstrated the same patterns in their mastery of spelling features. Unlike the children, however, the spelling errors of adults suggested both phonological coding deficits and difficulty with word endings in general. Word endings (suffixes) signal a change in meaning. Difficulties that are specific to the spelling of word endings suggest a specific difficulty with understanding and use of the morphology or meaning system of the language. In her review of research, Ehri (1991) concluded that learning to spell evolves through a combination of processes including inductive learning (abstracting generalizations from experiences with words), scaffolding (building new insights on previously mastered concepts), and explicit teaching. To support student progress through the various stages of spelling acquisition, instruction must be sequential (from letter–sound patterns, to rule-governed patterns,

to meaning-based patterns) and systematic. Instructional manuals such as *Words Their Way* (Bear et al., 2000) support this approach.

The Constructivist Theory of How Spelling Is Learned. The field of psycholinguistics, a blend of theories about the development of cognition and language, provided the foundation for the constructivist theory of literacy acquisition (see Sawyer, 1991 for a detailed discussion). The theory is based on two principal assumptions. The first is that the individual actively constructs knowledge out of the full range of prior experiences in his or her environment. What one learns depends, in part, on the knowledge and experience that is already in place to support new learning. Provided with rich experiences, children naturally abstract the pertinent details they are ready to attend to, work out an understanding of these details, and build them into systems of understanding about the world. The second assumption is that the process of constructing knowledge is most effectively supported through authentic or real-world (as opposed to contrived) experiences. Within this framework, reading and writing personally meaningful texts are the experiences out of which both word recognition and spelling develop.

The constructivist theory presumes that skill with written communication develops much the same as for oral communication—the impetus is the personal drive to communicate. Students learn to read by reading themselves and by seeing reading modeled by others; they learn to spell by writing their own messages and reading messages written by others. Within the framework of a model derived from constructivist theory, teachers initially encourage invented spelling to support communication. Correct spelling is expected to evolve through purposeful attention to words the person specifically wants to learn, and through repeated exposure to frequently used words encountered when reading text or the written messages of others. Orthographic units, whether whole words or spelling patterns, are the predominant focus. Specific and formal instruction involving subskills associated with the alphabetic system, outside the context of purposeful reading and writing, is not an acceptable practice within this theoretical framework.

The whole-language approach to literacy acquisition is the prominent illustration of a constructivist model in practice. This approach incorporates a collaborative process to support learning in which teachers model reading and writing and become partners with students in developing communication skills through supportive questioning or by supplying important pieces of information about the system of written communica-

tion as needed (e.g., correctly pronouncing a word a child has misread only when the error affects meaning, or writing the correctly spelled word under a word a child has written using invented spelling), to meet the learner's personal communication intentions. As with learning oral communication, this approach assumes that such personally meaningful interactions with print will lead students to acquire the knowledge, rules, and conventions needed to accomplish their communication goals using the print medium. This emphasis on interactions with personally meaningful material contrasts with more traditional approaches that employ a common text for reading skill development or a workbook containing writing exercises (copying sentences; filling in blanks; writing a paragraph based on a provided sentence stem). Key to success within the whole-language approach is structuring supportive learning opportunities that focus on knowledge and skills that are within the learner's "zone of proximal development" (Vygotsky, 1962). Teachers should organize knowledge, skills, and content to establish the most receptive climate for specific new learning. The learner's current knowledge, skills, and interests must determine what information or strategy the teacher selects to model or teach in supporting the learner's communication needs of the moment (see Sawyer, 1991). This places a tremendous responsibility on the teacher to effectively assess individual communication competencies, identify knowledge and skills that would be most helpful, and structure literacy activities that support learning within the zone of proximal development.

Tompkins (2002) describes a one-semester intervention program for 24 seventh-grade poor readers that emphasized a constructivist approach called *process writing.* Students' reading levels ranged from first to sixth grade. Tompkins found that spelling was the most severe mechanical problem the students had. Sixty-seven percent spelled phonetically, with skills at the first- to third-grade level. Although some improvement in spelling was noted at semester end, spelling remained a serious problem. On average, students gained one grade level on an inventory of spelling development. However, one third of the students had made no progress in spelling by the end of the study. Tompkins does not describe any specific instruction provided to support spelling. Any gains made were apparently the result of personal discoveries students might have made. Despite the measured gains some students did demonstrate, error analysis suggested that the phonological and orthographic cueing systems were generally not being integrated.

Butyniec-Thomas and Woloshyn (1997) specifically examined the effects on spelling of explicit instruction (subword and whole-word strategies), whole-language instruction (target words used to complete writ-

ing activities), and the two in combination. Explicit instruction alone, or in combination with whole-language instruction, yielded growth among third-grade students that was superior to that of the whole-language approach alone. Results of this study and the Tompkins study already discussed suggest that learning to spell effectively among older poor spellers is, at best, likely to be a slow and undependable process within a constructivist framework.

Two extensive reviews of research on spelling instruction cast further doubt on the efficacy of an exclusively naturalistic approach to spelling acquisition as embodied in the whole-language approach. Graham (2000) reviewed more than 60 research studies of spelling and spelling instruction, which involved students ranging across the grade span of first grade through college. He concluded that, overall, research findings support a combination of incidental learning and direct instruction to be most beneficial. Scott (2000) reviewed research on three methods of spelling instruction—memorization of lists, word analysis, and indirect instruction via authentic reading and writing activities—as these apply to poor spellers. She concluded that poor spellers must be provided with intense, systematic, and individualized instruction. The poorest spellers, regardless of age, require basic work in phonological awareness and the alphabetic principle to support their learning of spelling strategies.

By way of a compromise between direct instruction in specific skills out of context and reliance on modeling and immersion in literacy activities to support acquisition of reading and spelling, Strickland (1998) proposes a balanced approach to instruction. A balanced approach brings together aspects of skills instruction including letter–sound knowledge, visual memory (how a word looks), and knowledge of word parts such as common suffixes and spelling patterns that might support spelling by analogy (p. 2l). Strickland recommends providing opportunities to acquire these skills through formal and incidental (spontaneous, context-based) instruction.

Conclusion. Research over the past 20 years has addressed the question of how we learn to spell from a variety of theoretical perspectives, resulting in two theories that attempt to explain the underlying mental processes involved in spelling and two that attempt to explain how people learn to spell. Arising out of this body of research are a few common conclusions that have relevance for adult literacy instruction:

- Both visual and auditory systems play important roles in learning to spell.

- Learning to spell proceeds in a predictable, developmental sequence.
- Phonological processing abilities are essential for growth in spelling.
- Reading experience supports spelling development.
- Pronunciation of words affects spelling accuracy.
- Analysis of spelling errors is useful for assessing spelling status and differentiating instruction for clusters of students having similar skill needs.
- Direct instruction involving letter–sound associations, syllable structures, spelling patterns, and derivational forms is essential and is most effective when coupled with reading and writing activities that are personally meaningful.

THE STATUS OF SPELLING IN ABE CLASSES

A View of Public Policy

To discover how spelling instruction is addressed in ABE programs, in Spring 2003 we informally surveyed, via an e-mail inquiry, state directors of literacy programs in all 50 states and the District of Columbia. We wanted to learn the extent to which there was explicit reference to spelling instruction in either a formal statement of policy or in recommended curricula, or if licensure requirements might be used to infer professional preparation to teach spelling, at some level. We asked the following questions: In your state, is there a policy statement or suggested curriculum having to do with teaching spelling in ABE classes? Does your state have standards for teacher licensure in adult education? Directors in 22 states and the District of Columbia responded. Responses indicated that, in these states, no policy or specific curriculum for spelling instruction is in place at the state level. However, the District of Columbia is currently field-testing a general ABE curriculum that does not now address spelling although the respondent indicated that this curriculum could possibly incorporate "new suggestions" for curriculum content. South Carolina reported that a general ABE curriculum is now being developed but did not indicate how, if at all, spelling will be addressed in the curriculum.

In all states responding, curriculum is reportedly the responsibility of local programs. The state director in Arkansas asked regional program directors to also respond to our questions. Seven replied and provided this

picture of spelling curriculum at the local level: One reported that there is no local spelling curriculum but that some staff development "touches on spelling"; two reported using a computer program; four reported using a variety of text sources including reading programs that incorporate spelling, phonics, and whole-word workbooks, and individual planning wherein spelling is incidental to vocabulary development. Comments described spelling instruction as involving "printing," "visualizing," "hearing correct pronunciations of sounds," "memorizing rules," and "studying patterns." We conclude that spelling instruction in ABE classes may have little guidance or structure beyond that provided by published materials that might be available in the classroom. A coherent view of spelling as a process that involves orthographic and phonological systems appears to be lacking.

Responses to our second question revealed that only 5 of the 22 respondents have specific adult education certification available. Only Arkansas requires this endorsement for full-time adult education teachers. Most require a teaching certificate in elementary or secondary education. However, no teaching certificate of any type is required for employment in adult education in Alaska, in some programs in Michigan (related to funding source), or in North Carolina. Three states indicated that professional development through state-sponsored workshops (about 20 hours) was required of teachers in adult education; two states indicated they are just beginning to consider standards for teacher competencies. It is not possible to infer from responses to our survey that ABE teachers have generally had some level of formal preparation for teaching spelling.

To consider how the results of our survey meshed with practice in all 50 states, we turned to the Survey of Professional Development for Adult Education Instructors (Tolbert, 2001). The survey found that 22 states require teacher certification in elementary, secondary, or adult education; 15 states apply sets of instructor competencies. An important finding of this survey is that more than two thirds of state adult education systems employ predominantly part-time instructors. Perhaps even more important, ". . . a majority of states reported . . . that they do not require preservice training of full-time, part-time, or volunteer instructors" (p. 9). Nine states require 10 to 20 hours of preservice training for volunteers.

Drawing on the results of our survey and the survey sponsored by the National Institute for Literacy, we infer that, at the state level, there may be little explicit consideration of spelling as an essential component in the education of ABE students. Not surprisingly, perhaps, we found that state policy reflects national guidelines. In documents containing statements

of national literacy goals, we found either no mention of spelling as an outcome goal (U.S. Department of Education, 2002) or only a reference to spelling embedded in the broader goal of attention to conventions of English usage (Stein, 2000). We must conclude that, in the absence of specific policy objectives, curriculum goals, and staff development, spelling may well be a neglected skill in adult basic literacy programs today. Some support for this conclusion was obtained from those "in the trenches" at a recent conference sponsored by Pro-Literacy Worldwide (Washington, DC, November, 2003). In a session presented by Sawyer and attended by about 60 literacy tutors, teachers, trainers, and program site directors from across the country, conferees were asked if they taught spelling directly and, if so, what degree of emphasis they placed on the skill. Without exception, responses indicated that spelling, when taught, was incidental to reading instruction and was not routinely addressed in any formal way. One teacher's emphatic comment aptly summed up the comments in the room—"These students need to learn to read! They probably can spell well enough to get by!" It seems that current practice, in the case of spelling instruction in ABE classes, may well adhere to that of current policy, or the lack thereof.

A Perspective on Practice

A large proportion of ABE teachers have experience teaching in K–12 settings (Sabatini et al., 2000; Smith, Hofer, Gillespie, Solomon, & Rowe, 2003). Their approach to teaching spelling to adults may well be influenced by practices in their K–12 classes. Traynelis-Yurek and Strong (1999) surveyed 670 school districts in 41 states to gather information on spelling instruction practices. They concluded that the status of spelling in the United States is unclear. Fifty-three percent of the school districts were using a published series of spelling texts in the elementary grades. Some districts combined individualized spelling (incidental to the writing activities of each student) with direct instruction (whole class lessons specific to a particular pattern or rule), or with the sequential lessons in published spelling texts, or with developmental spelling (perhaps associated with a particular stage of development appropriate for subgroups within the class). In an Internet search of the 37 state departments of education that publish curriculum guides, Traynelis-Yurek and Strong (1999) found only four documents that mentioned a spelling guideline consistent with its use as a language convention, rooted in language process. In this context, we must assume that even those adult literacy teachers with K–6 teaching cre-

dentials may have limited experience in assessing spelling status or tailoring instruction to the special needs of adults in basic education classes. We conducted a similar search of ERIC documents to find materials prepared by state agencies that address spelling instruction in adult basic education. The Massachusetts Career Development Institute (1998) published an ABE curriculum that specifically addresses spelling. The approach is rule-governed phonics instruction. The Port of Baltimore (Janiszewski, 1994) published a workplace skills program for reading and spelling development that is a word-structure approach, supplemented with some rules for letter–sound correspondence. The Colorado State Department of Education (1991) published a handbook to prepare volunteers who tutor adults in basic skills. The spelling section advocates a "neurolinguistic" approach for students on reading levels 5–12. This approach seems to be based on the assumption that good spellers use a remembered visual image of a word followed by a kinesthetic check to see if it "feels" right. Developing visual memory is a dominant focus in this training document and, thus, it would seem to relate to a uniprocess theory suggesting that spelling is rooted in word-specific knowledge. This may be similar to the conclusions reported by Burt and Fury (2000) and Cunningham and Stanovich (1990), as discussed earlier in this chapter.

Our sampling of curricula tends to confirm, in the field of adult literacy, the findings of Traynelis-Yurek and Strong (1999) in K–12 education: Approaches to spelling instruction are mixed. Implicit in these curricula are commitments to various theories of what is required in order to spell—access to the lexicon (visual route), establishing graphophonic relationships (phonological route), or understanding the orthographic structure of words as these relate to pronunciation and meaning (morphophonemic route).

Two additional documents we reviewed were prepared by literacy providers and bring the reality of teacher–learner interactions to bear on spelling instruction. *If Only I Could Read, Write, Spell* is the product of an action research project sponsored by the Tennessee Literacy Resource Center (1994).[2] The teachers involved in this project recommended that instructional strategies begin with assessment of phonological awareness, followed by lists of words relevant to the learner as well as word sorts to strengthen letter–sound correspondences and to recognize spelling patterns as these relate to sound and meaning.

The second document, by Hager (2001), describes techniques for teaching beginning level (0 through Grade 2) adults. Drawing on 8 years of

[2]The study was conducted at the Center for Literacy Studies at Knoxville.

experience teaching ABE classes, Hager recommends an integrated approach wherein word analysis (visual/auditory) and spelling (auditory/visual) instruction complement each other, and the multisensory approach (seeing, saying, and tracing or writing) supports learning phonetically irregular words. This is the only source we found where a specific amount of time (20 minutes of a 3-hour session) is suggested for spelling instruction during each class meeting.

We also examined some guides for teachers that specifically address spelling instruction. We reasoned that these materials might have been used in K–12 teacher preparation programs or graduate classes, or as resources in professional development programs. Chall and Popp (1996) advocate a phonics approach. The importance of prerequisite skills—rhyming, segmenting, and blending—is noted, along with the necessity of learning a few whole words to form the foundation for learning initial consonants and spelling by analogy, then sound-to-letter spelling, and learning rules or generalizations. In contrast, Rosencrans (1998) recommends an approach that combines whole language with phonics through word sorts and other attention-focusing strategies such as word webs (showing how the meaning of different words relate). These activities bring visual, phonological, and semantic abilities to bear on the process. This approach is probably best described as balanced.

The Texas Education Agency (1996) produced a teacher's guide to spelling for Grades K–12. This guide defines spelling as a critical literacy skill acquired within a framework of five developmental stages. The importance of linking learning to read with learning to spell and write is underscored.

The Utah Outcome Based Curriculum Development Project (Utah State Office of Education, 1985) developed materials for preliteracy (refugees) and literacy (beginning and nonreader) adults. The spelling component of the literacy curriculum appears to be consistent with dual-route models of learning. Instruction is designed to develop skills for committing whole words to memory, as well as using rules to support grapheme–phoneme correspondences.

We leave this survey of current practice with two impressions: (a) Spelling instruction in ABE classes—what to teach and how to teach—is most likely left to the discretion of the teacher, and (b) Teachers are given little opportunity to specifically learn about spelling as a subject to be taught and a process to be learned. It appears that neither public policy nor practice substantially address a foundational literacy skill that has value in society.

ABE STUDENTS WITH SPECIAL NEEDS

Adults With Learning Disabilities

The U.S. Employment and Training Administration (1991) estimated that 50% to 80% of all ABE students reading below the seventh-grade level have learning disabilities. The incidence in the entire U.S. population is estimated at 15% to 30%. The national adult literacy survey (Kirsch, Jungleblut, Jenkins, & Kolstad, 1993) reported that whereas 21% of the general population functions at the lowest literacy level (Level 1), 58% of individuals who claim a learning disability demonstrate skills at Level 1. Clearly, it is important for educators in ABE programs to recognize the special learning needs of their students with learning disabilities.

A learning disability is commonly defined as significant difficulty with learning, despite adequate opportunity to learn, in the absence of intellectual, sensory, environmental, or emotional factors that might impede learning. In K–12 programs, a significant point difference in score (referred to as the discrepancy) between intelligence and achievement has historically been used to determine if a learning disability may be present. Students in ABE classes who left the K–12 system in the United States after about 1979 might report that they were identified with a learning disability. However, information obtained at intake for ABE services can be compiled to draw inferences about a possible learning disability. For example, a student who left school in ninth or tenth grade (thus having had ample opportunity to learn), who appears to have a good oral vocabulary (which reflects an adequate level of intelligence to have profited from instruction), reports no history of significant vision, hearing, or adjustment difficulties, but reports that very poor reading or spelling ability interferes with getting a job or advancing on the job, should raise the suspicion of a possible learning disability.

Low literacy may be the product of a learning disability, which is generally understood to be a consequence of biology—the way the brain works. Dyslexia, a specific learning disability, refers to a learning difficulty that affects reading, writing, and spelling. A specific learning disability is our focus in this section. We refer readers to Corley and Taymans (2002) for a complete review of research on learning disabilities in adult education.

The National Institute for Literacy (NIFL) convened a national focus group in 1997 to consider services for all students with disabilities in

ABE programs. Several important points were made: (a) A large subset of the ABE population has one or more disabilities that can affect literacy acquisition; (b) ABE administrators and service providers lack the training necessary to meet the needs of these clients; (c) Students with learning disabilities are the most problematic with respect to the provision of appropriate educational services; and (d) Services to learning-disabled adults vary greatly from state to state (NIFL, 1997, pp. 9–10).

In a needs-assessment survey of 381 adults with learning disabilities, Hoffman et al. (1987) found that the most significant learning problems students reported involved spelling and reading. Sixty-five percent reported problems with spelling and 63% with reading. The authors noted that these two academic areas continue to inhibit adults in vocational rehabilitation programs. In this same study, memory difficulties were reported by 30% of adults with learning disabilities.

Spelling ability among students with learning disabilities is generally poorer than that of low-achieving peers who are not learning disabled (Deshler, Schumaker, Alley, Warner, & Clark, 1982). Furthermore, the magnitude of the spelling deficits increases as students move from elementary to secondary school (Poplin, Gray, Larsen, Banikowski, & Mehring, 1980). Among students with learning disabilities, spelling strategies change little over time. Bruck (1993) found that among college students with a childhood diagnosis of dyslexia, poor spelling was primarily due to failure to acquire letter–sound mappings. Furthermore, the students' use of orthographic (visual) and morphologic (word root/meaning) information was related to the level of reading and spelling skill they possessed. She concluded that extensive reading—exposure to print—was important in developing the component skills of spelling. Davis, Gregg, Coleman, Habiger, and Stennett (2002) found that college students with a childhood diagnosis of a learning disability (LD) were more dependent on phonological (auditory) coding for spelling words than non-LD peers. The LD group primarily used a letter–sound strategy. However, those with stronger orthographic knowledge were relatively more successful (Gregg, Knight, Hoy, Stennett, & Mather, 2002). As noted in our earlier consideration of normal acquisition, reading facilitates spelling, through interaction of the phonological and orthographic routes.

A specific learning disability is presumed to be the result of a core deficit that limits the ability to process phonological information (Lyon, 1995). A strong relationship has been established between phonological abilities and reading and spelling (Lundberg, Frost, & Peterson, 1988; Rhol & Tunmer, 1988; Stuart & Masterson, 1992; Treiman, 1991; Wagner

& Torgesen, 1987; Wimmer, Magringer, & Lander, 1998). The deficit in phonological processing abilities occurs in families and may be genetically transmitted. Pennington et al. (1986) examined the spelling errors of 24 adults with dyslexia, 17 of their unaffected relatives, and 17 control subjects matched by spelling age to the dyslexics. The unaffected relatives were significantly better on reading and spelling tasks but similar to those with dyslexia in terms of IQ, age, and education. Analysis of spelling errors made by each of the three groups showed that the dyslexics performed more like the younger age controls when complex phonological skills were considered, but like the unaffected adults when complex orthographic skills were considered. The researchers concluded that, among the families in this study, an inherited cognitive deficit in phonological processing was the root source of dyslexia. However, the reader is urged to heed the fact that spelling ability is learned, not inherited. In their study of spelling among more than 1,000 adults, Green and Schroeder (1992) concluded that although specific aptitudes or dispositions may affect spelling, spelling is a learned skill, not an inherent aptitude.

Learning disabilities are heterogeneous. They may affect learning differently from person to person and may vary in severity as well. For these reasons, assessment undertaken in order to detect a learning disability, as well as to estimate its specific impact on the learner, is critical for planning effective educational intervention. With such a large concentration of individuals with learning disabilities in ABE classes, it seems reasonable to use assessment of spelling ability to also infer if, and in what way, a learning disability might be limiting growth in spelling.

Kamhi and Hinton (2000), as discussed earlier, noted that poor spellers seem to follow a different developmental route than good spellers, relying primarily on visual strategies—on how a word looks—rather than on how it sounds. The authors suggested that this overreliance on only one input system might be due to limited phonological knowledge. Research cited throughout this chapter supports the importance of both the phonological (auditory) route and the orthographic (visual) route, in consort, for achieving efficient and accurate spelling.

Convincing evidence has accumulated to suggest that activities that develop phonological awareness among adults with low literacy skills result in improvement in reading and spelling (Durgunoglu, Nagy, & Hancin-Bhatt, 1993; Durgunoglu & Oney, 2002). For students who show a phonological processing deficit, whether due to biology or previous educational experiences, or lack thereof, this is a critical entry point for intervention. Phoneme discrimination, segmentation, sequencing, and blending

are critical foundational skills on which phoneme–grapheme knowledge is built. The important influence of accurate pronunciation on spelling was discussed earlier. Moats (1995) carefully documented the relation between errors in the perception of sounds and errors in spelling. Sawyer, Lipa-Wade, and Kim (1999) documented these relationships as pivotal in understanding spelling performance among dyslexic students having the greatest number of grapheme–phoneme coding errors.

A review of 38 published studies of spelling interventions designed primarily for elementary school students with LD (Fulk & Stormont-Spurgin, 1995) revealed that a variety of approaches can yield positive results. The significant caveat was that the instruction be systematic (carefully sequenced). Fulk and Stormont-Spurgin make two other points: (a) The underlying cognitive issues related to poor spelling—phonological awareness, language, memory, visual-motor processes, or inefficient study strategies—must be addressed along with instruction that adheres to a developmental sequence, and (b) Students with LD are not likely to spontaneously acquire spelling skill from exposure to literature or invented spelling approaches in the naturalistic framework of whole-language instruction (p. 509). A similar review of 27 published studies led to the conclusion that structured intervention was essential for growth in spelling (McNaughton, Hughes, & Clark, 1994).

Graham (1999) conducted an extensive review of research on handwriting and spelling instruction for students with LD. He approached this review from the position that both explicit, systematic instruction and incidental learning approaches are essential in order to maximize the development of spelling in students with LD. Studies of spelling instruction were discussed within 10 categories related to word selection, instruction and practice, knowledge of the spelling system, and application and use of technology. Although Graham found support for this balanced approach in the research, he also stressed the need for further empirical research.

Use of computer-assisted spelling programs is growing in ABE settings. Fulk and Stormont-Spurgin (1995) reviewed nine studies that addressed this approach with LD students. Only three studies reported effects on spelling achievement, and only one of these reported significant achievement gains. However, it was suggested that these gains might be attributed to the novelty of using computers. Eight studies reported the positive effects of these programs on developing positive attitudes and increasing on-task practice rates. The programs provided models of correct spelling when errors were made and opportunities to imitate such models (p. 499). Fulk and Stormont-Spurgin note that the time teachers need to spend learn-

ing how these programs work, organizing them for delivery, and monitoring student progress is an important consideration in selecting computer-assisted spelling instruction. This poses a significant limitation in ABE programs staffed primarily by part-time teachers.

MacArthur (1999) reviewed research on the utility of computer tools (i.e., spell checkers in word-processing programs) in supporting the mechanics of writing. He cautions that all methods involved with getting words into print tap working memory capacity and, for some, using a computer tool may be more burdensome than writing by hand. In his review of research on spell checkers, MacArthur identifies two major problems of spell checkers for students with LD: failure to flag a misspelling if it is another real word, and failure to reliably suggest the correct spelling. In a comparison of 10 spell checkers, correct spellings were suggested for only 44% to 66% of misspelled words identified. For severely misspelled words, the rate of correct suggestions dropped to 16% to 41%. Although computer-assisted instruction and computer tools for writing are useful, there are significant limitations that bear on their potential in ABE classes with LD students.

Adults With Hearing Impairments

The National Adult Literacy Survey (Kirsch et al., 1993) found that 36% of adults who claim hearing difficulties function at the lowest level of literacy skill (Level 1). We found no statistics on the percentage of adults with hearing impairments attending ABE classes. Although it is likely that the majority of adults in these classes are not completely deaf, we believe that it will be useful for adult literacy providers to recognize the special challenges to spelling that hearing impairments pose.

Recent reports indicate that less than half of 18-year-old deaf students leaving high school have reached a fifth-grade level of reading and writing competence, and more than 30% of those leaving school are functionally illiterate (skills equal to NALS literacy Levels 1 or 2; Marschark, 2001). Establishing the link between spoken and written language is not easy for those who cannot readily access spoken language. Auditory discrimination of some or many sounds will be difficult for those students in ABE with hearing impairments and will affect their ability to establish letter–sound correspondences.

Phonological abilities among the deaf develop out of a combination of articulation cues, speech reading, finger spelling, residual hearing, and exposure to writing, but no one of these, independent of the others, is

sufficient (Marschark, 200l). This suggests that working on spelling with the hard-of-hearing in ABE classes requires focused attention to the visual-motor aspects of speech—to feel in the mouth and see in a mirror or on the mouth of another how confusing or indistinguishable sounds are formed and how each relates to a letter or a spelling pattern. Burt and Shrubsole (2000) found that, among college students, the most significant difference between good and poor spellers was their ability to accurately pronounce unfamiliar words. Poor spellers produced inaccurate pronunciations for printed nonsense words, suggesting weakness in phonological coding.

The deaf rely heavily on visual language. American Sign Language, which involves a kind of logographic representation for concepts and words, is reportedly easier for deaf children to learn and to use than any other form of English (Baker & Baker, 1997; Caccamise, Ayres, Finch, & Mitchell, 1997; Finnegan, 1992). Similarly, young deaf children focus on the meaning of whole words in text to the detriment of the meaning of phrases and sentences (Marschark, 2001). However, Gaustad, Kelly, Payne, and Lylak (2002) found that deaf college students do apply a visual segmentation of whole words that reflects knowledge of the morphological structure at a skill level that is about equal to that of hearing middle-school students. These students had learned to use the orthographic system to support comprehension. Aaron, Wilczynski, and Keetay (1998), in their investigations of spelling among deaf students, also found evidence of visual segmentation. In their study, deaf students' spelling of nonwords projected briefly onto a screen showed dependence on memory for commonly appearing intraword letter patterns (letter strings that appear frequently in English words, e.g., *"kram"*), rather than on pure visual memory for any letter string presented (letter combinations not found in real English words, e.g., *"rmka"*). More errors were made in reproducing nonwords built from strings of letters not found in English.

For teachers of hard-of-hearing adults, the studies we have referenced suggest the need to approach literacy instruction that addresses, simultaneously, the learning of whole words, letter–sound correspondences, spelling patterns, and structural units of meaning. In a 4-year study of how deaf children learn to spell, in a language-rich environment that applied a process approach to writing, Mayer and Moskos (1998) found that the children progressed through the same sequence of stages as hearing children—scribble, random strings of letters, invented spelling, conventional spelling. We might expect hard-of-hearing adults to also move through stages as they acquire knowledge of the graphophonic and orthographic systems and learn to apply this knowledge in personally meaningful writ-

ten communication. Critical to supporting this process, however, will be individual assessment to identify what is already known and is available to serve as a beginning point for instruction.

English for Speakers of Other Languages

The number of adults enrolled in ESOL classes is large and growing rapidly (M. Burt, Peyton, & Adams, 2002). In 2001, 42% of adults enrolled in state-administered, federally funded programs were enrolled in ESOL classes. In addition, English-language learners are served in a variety of other programs, including ABE, adult secondary education, community-based, and volunteer programs for which enrollment rates were not available. In their review of available research over 20 years, Burt et al. (2002) summarized findings as follows: (a) The degree of literacy in the first language (L1) significantly affects ability to acquire a second (L2); and (b) Age; motivation; educational and sociocultural background; home, work, instructional environment; and presence or absence of a learning disability also affect success. Younger, more advantaged students, who are motivated to achieve at work or in the community and have some level of literacy in L1, acquire L2 literacy skills with greater ease. M. Burt et al. (2002) list five types of L1 literacy that describe the L2 English learner: preliterate, nonliterate, semiliterate, non-Roman alphabet literate, and literate in another Roman alphabet. The greater the degree of L1 literacy (last two types), the greater the potential to transfer literacy concepts and skills to L2 task demands (M. Burt et al., 2002, pp. 2–4).

Meschyan and Hernandez (2002) studied Spanish-speaking college students who were learning English. They found that decoding ability in L1 predicted decoding skill in L2 (U.S. Department of Human Services, 1985, in National Center for ESL Literacy Education, 2003). ESOL learners with skills classed within the first three types of L1 literacy mentioned earlier pose the greatest challenge to spelling instruction in ABE classes because they have little knowledge about any writing system to draw on.

It is possible that proficient L2 users could offer informative insights into the processes they apply when spelling, and these insights might inform literacy instruction. Cook (1997) compared the spelling of 375 adult L2 users of English (in the United Kingdom) with 1,492 L1 native speakers, both children and adults, in order to determine if L2 users applied both direct access (visual) and letter–sound (phonological) strategies, or if they would show a preference for the prominent route associated with L1 (e.g., Japanese = characters that represent syllables or words but not

speech sounds; Spanish = letters that map directly onto speech sounds). Cook found that the phonological route was dominant, regardless of L1. A preponderance of L2 errors involved inappropriate letter–sound correspondences, some of which could be attributed to variation in pronunciation. For example, a native speaker of Japanese, which does not contain the spoken representation for /l/ might, initially, code that sound with a /w/ when spelling English words. Accurate pronunciation does play a role in achieving accurate L2 spelling.

Durgunoglu et al. (1993) found a cross-language transfer (Spanish to English) of phonological awareness that affected word reading in L2, as well as evidence of the impact of phonological awareness among very low-literacy adults learning to read and spell in their native (Turkish) language (Durgunoglu & Oney, 2002). These studies provide additional support for the idea that phonological awareness is a foundational skill that supports learning to decode and spell in alphabetic languages and this awareness is facilitative for children and adult learners.

Tompkins, Abramson, and Pritchard (1999) studied the acquisition of spelling among ESOL students in Grades 3 and 4, as compared to native English-speaking peers. Students in the study came from five linguistic backgrounds and attended school in two different neighborhoods—low income, ethnically diverse; affluent, upper-middle class. The researchers took spelling productions from classroom journals and classified them according to five developmental stages. They then analyzed and described the errors. Results showed that these L2 students progressed through the same sequence of developmental stages as L1 users and that no difference in development could be attributed to native language influences except that English learners tended to omit inflectional endings. (Such omissions are often apparent in the oral language of L2 users.) Additionally, this study identified significant differences in development that distinguished students in the low-income school from those in the affluent school, where spellings were found to be more conventional. This was true for L1 and L2 students. The authors cite the body of literature on the relationship between socioeconomic status and literacy development as a possible explanation.

It is important to remember that adults with learning disabilities are also enrolled in ESOL classes. A language-based learning disability affects learning in all languages but may be less apparent in languages where letter–sound associations are regular (Paulesu et al., 2001). Among Japanese children, for example, teachers report that literacy learning disabilities first become apparent when students begin to learn English, at about fifth grade (Sawyer, 1995, consulting in Fukushima, Japan). Researchers who

work with learning disabled L2 learners suggest that multisensory learning strategies (Sparks, Ganshow, Kenneweg, & Miller, 1991) and structure (Schwarz & Burt, 1995) are critical. The need for targeted assessment to determine the appropriate entry point is also emphasized (Holt, 1995).

IMPLICATIONS FOR PRACTICE

In our informal survey of state program directors, discussed earlier, one response to our question regarding the existence of a state policy or suggested curriculum for the teaching of spelling in ABE classes was, "No, we have no policy regarding teaching spelling to adults and we have no curriculum. I found your request interesting, however, because I guess I never thought much about spelling."

The work discussed in this chapter suggests that spelling should be a specific component of instruction in ABE classes and that this instruction will be most effective if:

- Spelling acquisition is understood as a developmental process that relies on the integration of visual and auditory systems for learning.
- Reading and spelling skill are understood as supportive of each other; decoding and spelling are taught in ways that reveal the morphophonemic nature of the English orthography.
- Phonological awareness is recognized as essential for internalizing the alphabetic principle (i.e., letters map onto speech sounds).
- Formal and informal assessment of students' knowledge and skills—phonological awareness, letter–sound correspondences, spelling patterns—precedes and informs instructional planning.
- Students are taught strategies that support learning whole-word units, letter–sound mappings, and spelling patterns as these relate to pronunciation and meaning.
- The focus of instruction is matched to the concepts about spelling that each student has sufficient background knowledge to learn (i.e., it is matched to the zone of proximal development).

In the special case of adults with a specific learning disability, effective instruction must be explicit, structured, sequential, and systematic. Multisensory techniques can focus attention, support memory, and facilitate accuracy.

In the case of ESOL adults, in order to be effective, instruction should begin at whatever stage the student is currently in. This requires determin-

ing the student's level of L1 literacy, assessing what the student knows about the English alphabet and print conventions, and providing instruction that is structured, sequential, and repetitive.

Although direct instruction is crucial when working with adults, learning is likely to be most efficient when the tasks are personally meaningful and instruction encourages students to apply emerging skills and concepts to activities that are integral to their daily lives—writing a get-well message, a note to a child's teacher, or notes related to job demands. Fagan (1988) engaged 50 low-literate adults in structured interviews to ascertain their understanding about reading and writing. On the whole, "writing" was understood as handwriting, not as communication. The adults' past experiences with instruction instilled an expectation that improvement in writing would require working on ". . . all the big and small letters, apostrophes, dots, and all that" (Fagan, 1988, p. 56) and sounding out words for reading. Fagan interpreted the perceptions of these adults as counterproductive to goals for becoming readers and writers. Word reading and spelling will be more successful if instruction is closely aligned with literacy tasks that the students recognize as relevant to their own lives.

IMPLICATIONS FOR FURTHER RESEARCH

Insights into the acquisition of spelling in the ABE population rest primarily on studies comparing the errors of adults to those of normally developing children. Knowing that relatively poor adult spellers exhibit about the same degree of knowledge, or lack thereof, as students in the elementary grades does not help us determine how they will respond to instruction or what approach to instruction will be most effective. Our review of research suggests the need for longitudinal studies of spelling among the ABE population, as well as carefully designed experimental studies that assess the efficacy of different instructional methods with adults at varying literacy levels. In addition, our review of current practice suggests the need to survey ABE administrators at the local level, across the country, to gain a better understanding of how the need for spelling instruction is being addressed.

IMPLICATIONS FOR PUBLIC POLICY

Our survey of state directors, our review of documents related to statements of national literacy goals (U.S. Department of Education, 2002),

and our review of the *Survey of Professional Development for Adult Literacy Instructors,* State Policy Update (Tolbert, 2001) suggests that spelling is a neglected component in guidelines for ABE programs, for training literacy providers, and for the allocation of dollars for instructional resources in ABE programs. In preparing this chapter, we have concluded that state guidelines for developing spelling instruction are needed in order to enhance educational outcomes for this population. Furthermore, states need to provide high-quality professional development to ensure that ABE teachers have the knowledge and skills necessary to provide effective spelling instruction.

Finally, it appears that national policy for literacy development has also neglected the role of spelling within the complex arena of literacy skill acquisition. Spelling is given only passing reference in *Equipped for the Future, Content Standards* (National Institute for ESL Literacy Education, 2003) and in *Bridges to Practice* (National Institute for Literacy, 1999). Whether this is the result of a conscious decision or an oversight is not immediately apparent. However, we have documented, through this review of research, that competent spelling influences an individual's potential to get and keep a job and to participate fully in one's family and community. Poor spelling reflects negatively on the speller—people question his or her attitude and even intelligence. Adult poor spellers recognize that this limitation is a barrier to full, effective participation in various aspects of life. Gaining spelling skill is no less important to students in ABE classes than acquiring skill in reading and math. It is vitally important that policymakers, program directors, and ABE teachers give immediate and careful consideration to providing specific and planned, as opposed to incidental, instruction in spelling. Discussion and clarification of the issues associated with spelling in adult basic education, led by those who interpret and shape national literacy policy, would benefit the field and offer much needed leadership for the states.

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