

# Can the Linguistic Interdependence Theory Support A Bilingual-Bicultural Model of Literacy Education for Deaf Students?

Connie Mayer

Metropolitan Toronto School for the Deaf

Gordon Wells

Ontario Institute for Studies in Education

Drawing on Cummins' (1989) linguistic interdependence model, proponents of bilingual-bicultural models of literacy education for deaf students claim that, if ASL is well established as the L1, then literacy in English (L2) can be achieved by means of reading and writing without exposure to English through either speech or English-based sign. In our opinion, this claim is based on a false analogy: the situation of the deaf learner of English literacy does not match the conditions assumed by the linguistic interdependence model. We draw on the work of Vygotsky and Halliday to develop a conceptualization of the processes involved in becoming literate, examining the particular and unique challenges that deaf students face as they strive to become members of the linguistic community of users of written English. We argue that becoming literate involves mastering three modes of language use: "social speech," "inner speech," and written text. In some respects the educational context for deaf students is analogous to that of other bilingual learners; in some crucial aspects, it is very different.

In recent years, there has been a move in the field of deaf education in Canada, and in North America more generally, towards the adoption of a bilingual-bicultural model, in which American Sign Language (ASL) serves as the principal language of instruction.<sup>1</sup> This approach is regarded by many as one which will "facilitate the students' language acquisition, learning and expression of knowledge through both . . . ASL and English" (Statement of Policy, Ontario Provincial

Schools for Deaf Children, 1993). Bilingual-bicultural proponents are firm in their belief that, if ASL is well established as the L1, then English literacy can be achieved by means of reading and writing without exposure to English in its primary form through speech or alternatively through English-based sign (Israelite et al., 1992).

The rationale underpinning this approach is the linguistic interdependence model, developed by Cummins (1989a, 1991a), which posits the existence of a common proficiency underlying all languages. On this basis, it is argued that cognitive/academic or literacy skills acquired in a first language can be transferred to the learning of related skills in a second language: "To the extent that instruction in L<sub>x</sub> is effective in promoting proficiency in L<sub>x</sub>, transfer of this proficiency to L<sub>y</sub> will occur provided there is adequate exposure to L<sub>y</sub> (either in school or environment) and adequate motivation to learn L<sub>y</sub>" (Cummins, 1981, p. 29). It is to this model that proponents of the bilingual-bicultural approach to deaf education are appealing, when they argue that, if ASL is recognized as the first language of profoundly deaf students, and used as the medium of instruction, the skills acquired in ASL can be transferred to the learning of English through literacy activities involving the use of written English.

As we shall attempt to show, however, this argument is based on a false analogy. For the situation in deaf education does not match the conditions assumed by the linguistic interdependence model.

Correspondence should be sent to Connie Mayer, 95 Ferrier Avenue, Toronto, Ontario M4K 3H6, Canada (e-mail: cmayer@oise.on.ca).

According to this model, it is assumed that a hearing person growing up in a literate culture will inevitably be exposed to and will probably learn the written as well as the spoken form of his or her first language. This literate proficiency can then be transferred to a second language, if the appropriate conditions for learning the second language arise, that is to say, participation in a linguistic community that uses this language in both the spoken and written modes. However, these conditions do not apply in the case of the profoundly deaf learner. Having minimal access to the auditory-oral channel of communication, the majority of profoundly deaf people do not develop intelligible speech, but learn a visual-spatial language, such as ASL, instead. Sign is thus their first language and, for face-to-face communication, it is equivalent to any other first language. However, this equivalence does not extend to writing for, despite efforts to create an orthography for ASL (Stokoe, 1960; Sperling, 1978), no sign language yet has a widely-accepted written form. When it comes to communicating through writing, therefore, deaf people must, of necessity, have recourse to the written form of some other language, such as English.

Here the applicability of the linguistic interdependence model breaks down. Since their first language (ASL) has no written form, profoundly deaf students cannot acquire literacy skills in their first language; consequently, they do not have literacy skills to transfer to the written form of a second, spoken, language such as English. In this, of course, their situation is similar to that of hearing students whose first language does not have a written form. However, unlike the latter, since they are unable to access the auditory-oral channel, they are also deprived of the support that hearing learners of the written mode of a second language receive from their growing mastery of its spoken form. Therefore, although in some respects the educational context for deaf students is analogous to that of other bilingual learners, in this crucial aspect it is very different.

The validity of this argument is further supported by the results of empirical studies of literacy learning by (hearing) second language learners (for a review of the research see Cummins 1983; 1984; 1991a; 1991b and Cummins and Swain, 1986). With respect to the

development of reading and writing in L2, the evidence indicates a positive correlation between the ability to read and write in an L1 and the subsequent ability to master these same aspects of the L2 (Treger and Wong, 1984; California State Department of Education, 1985; Gonzalez, 1986; Canale et al., 1987; Falter, 1988; Cumming, 1989). Further, evidence suggests that the transfer of reading skills from L1 to L2 is less when the orthographies of the two languages are dissimilar (Genesse, 1979; Cummins et al., 1984). However, there is no indication of a correlation between the ability to communicate orally in an L1 and the subsequent ability to read and write in the L2 (Goldman, 1985; Cummins et al., 1985). Although languages may be "interdependent," therefore, the evidence suggests that, for facilitation in L2 literacy learning to occur, the learner must have mastered the comparable literacy skills in his or her first language.

Nevertheless, despite the fact that ASL does not have a written form, proponents of the bilingual-bicultural approach still believe that there are relevant relationships between ASL and written English that will allow for a positive transfer from the sign mode of ASL to the written mode of English. Consequently, they believe that a deaf child can acquire literacy in written English without first or simultaneously needing access to English in its spoken form, and that the learning of written English will be facilitated by utilizing ASL as the language of instruction. Indeed, although they have received little critical examination (Stewart, 1993), it is these beliefs that seem to have been adopted as the basis for the policy decisions currently being taken in deaf education.

In the preceding paragraphs, we have briefly indicated why we consider that these beliefs are mistaken. Our aim, in the remainder of the article, is to explain in more detail why we believe this to be the case. We should make it clear at the outset, however, that we shall not be concerned with arguing whether or not ASL should play a major role in the education of deaf children. Suffice it to say, we believe that it should. Nor is it our intention to question the acceptance of ASL as a bonafide language and the natural language of the Deaf community. We believe that it is. Rather, our challenge will be addressed to the premise that deaf students can achieve English literacy by approaching writ-

ten texts solely through the medium of ASL. To this end, we shall draw on the work of Vygotsky and Halliday to develop a conceptualization of the processes involved in becoming literate and then examine the particular and unique challenges that deaf students face as they strive to become members of the linguistic community of users of written English.

#### The Relationship between Inner Speech and Written Language

If writing were simply speech written down, learning to write would be a relatively straightforward matter for the hearing child, once the principles of phoneme-grapheme correspondence had been mastered. However, this does not prove to be the case. As Kress (1982) remarks, "Considering how painlessly children learn to talk, the difficulties they face in learning to write are quite pronounced. Indeed, some children never learn to write at all, and many fall far short of full proficiency in the skills of writing" (p. ix). The main reason for this is that, compared with speech, written language is much more abstract; it also requires a much greater degree of conscious awareness of the processes through which meanings are realized, that is to say, the choice of appropriate lexical items and of the means for representing the relationships between them.

In the normal course of development, as a number of studies have shown, children spontaneously master the oral mode of their first language, provided that they have frequent opportunities to participate in conversational interactions with more mature members of their linguistic community as they engage in joint activities of various kinds (Bruner, 1983; Cross, 1978; Wells, 1986). And, in learning to talk, they are also inducted into the culture's way of making sense of experience, as this is encoded in the meaning potential of the culture's language (Halliday, 1975a, 1993). In the early stages, the child's speech is multipurpose but, according to Vygotsky (1987), around the age of three or four, the child begins to differentiate between social speech and speech for self. This is first seen as the child begins to use the linguistic resources learned in social interaction as a means of self-direction and solo reflection in the mode of egocentric speech (Wertsch, 1985). In due course, this overt form of speech for self disappears, to

become the mode of intramental activity that Vygotsky referred to as "inner speech." Because no other interlocutor is involved, the topic does not need to be made explicit and so inner speech tends to consist largely of predications; it also tends to be compressed and idiosyncratic, as multiple dimensions of meaning are handled simultaneously. It is in this medium, argues Vygotsky, that we engage in individual verbal thinking.

Inner speech thus stands in an intermediate position between oral speech and writing. "While the development of external (i.e., social) speech precedes the development of inner speech, written speech emerges only after the development of the latter. Written speech presupposes the existence of inner speech" (Vygotsky, 1987, p. 203). Inner speech is also intermediate in the sense that it utilizes the resources learned in social speech, but in an abbreviated and personal manner. However, for the meanings constructed in inner speech to be expressed in writing, they have to be rendered maximally explicit and coherent so that they are intelligible to a nonpresent reader. Thus, as Vygotsky puts it, "[The] transition from maximally contracted inner speech (i.e., speech for oneself) to a maximally expanded written speech (i.e., speech for the other) requires a child who is capable of extremely complex operations in the voluntary construction of the fabric of meaning. . . . Written speech forces the child to act more intellectually. It requires conscious awareness of the very process of speaking" (1987, p. 204).

Not surprisingly, therefore, learning to write is a lengthy and, for many children, an arduous undertaking, since mastery must proceed on two levels at once. First, there is the learning of the second-order symbol system, both how to produce the visual symbols themselves and also how to relate them to the first-order symbols used in oral speech. This latter knowledge is what, in an alphabetic language such as English, is involved in learning to spell. And second, there is the learning of how to translate the meanings of inner speech into the abstract, sequentially organized grammar of written language—grammar that differs significantly from that of oral speech (Halliday, 1989, 1993). In light of this Vygotskian account of the development of writing in the hearing child, we can now consider the task that faces a child who has no access to oral speech. To what extent is it similar and in what

ways does it differ? In particular, what part does inner speech play in this process for the deaf child?

### The Nature of Inner Speech and the Development of Literacy in the Deaf Child

Recent studies suggest that deaf children learn sign language spontaneously if, like their hearing counterparts, they have adequate opportunities to interact with more mature members of their community who regularly use sign as a medium of communication (Kyle et al., 1985). For these children, sign language functions equivalently to oral speech in providing access to their culture and its "theory of experience." When it comes to learning to read and write, on the other hand, there is general agreement that deaf children find this much more difficult than their hearing peers. In acquiring literacy in English, for example, deaf children rarely progress much beyond a fourth grade level (King and Quigley, 1985).

Conrad (1979) attributed the poor reading abilities of deaf children to a lack of internal speech. He conducted studies showing that deaf children did not utilize internal speech, if internal speech was treated as synonymous with thinking aloud or with subvocal talking while carrying out cognitive activities. Bernstein and Finnegan (1983), in a critique of Conrad's study, counter that, as long as a child's cognitive system has access to information (for many deaf children this would involve sign language), "much of the child's thinking, concept formation, evaluation of alternatives, and the like, is carried out in 'mentalese', rather than explicitly through internal speech" (p. 488). Webster (1986) also argues strongly that deaf children do employ some sort of inner code in their thinking. He speculates that this "might include aspects of gesture, fingerspelling and sign language, as well as inner speech sounds" (p. 163).

Furthermore, Klima and Bellugi (1979, p. 88-124) argue that based on the evidence they examined, it was clearly demonstrated that deaf people, whose native language is sign, code and rehearse through the visual-manual properties of sign in a manner functionally comparable to the way that hearing individuals code in the acoustic-articulatory properties of words. A group of studies (reviewed by Bench, 1992, p. 166-172) indi-

cates that, with respect to both short-term and long-term memory tasks, deaf children tend to employ a visual-spatial code for recall, not the speechlike code utilized by hearing children. Even Conrad, while he was arguing that deaf children lacked internal speech, believed that a rich mental life could be carried out in sign language, fingerspelling, and print. In sum, taking into account the confounding effects of the different linguistic media involved, investigations into the cognitive processes of deaf children indicate that their thinking and reasoning abilities are essentially equivalent to those of hearing children (Furth, 1973; Rodda and Grove, 1987), even though their literacy development is not.

However, there is one area of written language development in which deaf children experience relatively less difficulty, and that is in the learning of conventional spelling. As early as 1926, Gates and Chase reported that 10-year-old deaf children spelled better than hearing children when they were matched for reading ability and IQ. Empirical studies conducted since then also suggest that with respect to spelling, deaf individuals are not delayed (Templin, 1948; Hoemann et al., 1976; Markides, 1976). However, studies have also shown a dissociation between reading level and spelling proficiency for the deaf (Hanson, 1983; Campbell et al., 1992). Hanson concludes that "while deaf persons appear to be at a disadvantage in acquiring reading when compared to hearing persons, it is of interest that no comparable disadvantage seems to occur for spelling" (p. 341). Campbell et al. go further and argue that because deaf people are better spellers than they are readers, it would seem that "models in which reading and spelling skill need to roughly align at different stages in development, may not hold for the deaf" (p. 195). They intimate sharp discontinuities between reading and spelling in the deaf population and suggest this may actually reflect an isolation of reading from spelling skills.

A possible explanation for this apparent discontinuity may lie in a consideration of Vygotsky's claim "that inner speech is a psychological formation that has its own unique nature, and that inner speech is a unique form of speech activity that has unique characteristics and stands in complex relationships to other speech forms" (1987, p. 257). What is the nature of the

relationship between the inner speech of deaf children (which appears to be visual-spatial) and the external speech forms of reading and writing that they are attempting to master? How might it influence the development of literacy?

Because, for hearing children, intermental functions rely so heavily on the acoustic properties of language, the resultant nature of inner speech is often characterized as having the qualities of an inner ear. However, given that the intermental activities of deaf children are generally much more strongly connected to the visual rather than auditory aspects of language, it seems reasonable to suppose that, rather than an inner ear, they utilize an inner eye. That is to say, whereas the nature of inner speech for hearing children could be described as auditory-oral, for deaf children, its nature could be described as visual-spatial (Jamieson, 1995).

When it comes to learning to spell, therefore, it seems likely that deaf children rely on their inner eye and, because of its visual-spatial nature, this inner eye proves very effective for the task. Certainly, as a result of the unpredictable match between sound and symbol in English, skilled hearing spellers generally monitor their performance in spelling, not by assessing whether a word they have written "sounds right," but whether it "looks right." Thus, in certain respects, the inner eye could be viewed as more effective for learning to spell than the inner ear utilized initially by hearing children. Thus, Webster (1986) observed that deaf children seem to rely on visual rather than auditory cues to recall spelling patterns and noted that this aligned them with good spellers generally, since it seemed that this was the most successful route to proficient spelling.

With respect to learning to read and write English at the level of lexico-grammar, on the other hand, apparently the inner eye may not be as effective as the inner ear. Proficient writers do not compose a text and then consider whether or not it "looks right"; instead, they read it over and consider whether it "sounds right." In this aspect of reading and writing, it seems, hearing individuals rely strongly on their inner ear to make linguistic decisions. Thus it could be speculated that the dissociation between reading and spelling levels in deaf children reflects the relative strengths and weaknesses of utilizing an inner eye as opposed to an

inner ear in the process of attempting to master the written form of an auditory-oral language. While learning to spell may be accomplished very efficiently through reliance on an inner eye, learning to read and write may not be.

A study by Hanson and Fowler (1987), in which they hypothesized that proficient deaf readers do access phonological information as they read, could be seen as providing support for this point of view. In Kelly's (1995) summary of the findings of this study, he describes this phonological recoding as "an idiosyncratic, yet consistent, sound based strategy" acquired despite profound hearing loss. In contrast to this strategy, he speculates that "deaf readers who use a less enduring iconic/spatial strategy for sustaining the contents of working memory face a greater danger that the words of a sentence may partly decay before their combined meaning can be constructed and stored in long-term memory" (p. 321). In a comprehensive review of the research done in this area, Leybaert (1993) also concludes that the positive relationship between phonologically based coding and reading seems well established in the deaf population, although she cautions that the nature of this relationship is not clearly understood.

Vygotsky (1987) further posits that the development of thinking, of inner speech, is closely tied to the development of the meanings of words. The word constitutes a "unique mode of reflecting reality in consciousness," since it is intimately involved in both speech and thinking and, conversely, "only an adequate conception of the word's mental nature can lead us to an understanding of the possibilities that exist for the development of the word and its meaning" (p. 249). Thus, in considering the word's mental nature, both the inner, semantic plane and the external, auditory/oral plane must be taken into account. For young hearing children, these two aspects are not differentiated—the spoken word is just another characteristic of the object to which it refers. Only later does the child separate the word from the object and begin to develop the ability to generalize word meaning. When describing the development of the deaf child's thinking, it becomes relevant to consider the "word's mental nature" for someone whose meanings are represented not in spoken words, but in the visual medium of signs.

Certainly the external aspect of speech for a deaf child is different. The word is not a spoken word, but a sign, and it is not the spoken word that becomes integrated with an object, but rather the motorically produced sign. Then, as the deaf child develops, it would be reasonable to assume that the sign becomes differentiated from the object in the same way as the spoken word does for the hearing child. The relationship between the semantic and external planes of speech for a deaf child must therefore be understood as a relationship between thought and sign rather than between thought and word. In one sense, it could be argued that, essentially, there is no difference between the two; the sign simply “stands in” for the word in its relationship to thought. And, just as in a consideration of any two spoken languages, one word (or sign) is not necessarily a better tool for thought than another.

However, because of the different modalities involved, signs are not in all respects equivalent to spoken words. Thus, although the “sign” functions as the unit of meaning in ASL, it is not completely interchangeable in sense and meaning with the “word” in English—or in any other spoken language. By virtue of the manner in which meaning is communicated through the medium of sign, an individual sign often conveys elements difficult to capture in an English word, just as spoken words can convey meanings that signs cannot. Nevertheless, when deaf children interact with written English, words and signs must, of necessity, be treated as functionally equivalent. As a result, in reading and writing, deaf children tend to map signs on to words as if there were a one-to-one correspondence, even though, in terms of the meaning they are attempting to communicate, words are often poor substitutes. The relationship between thought, sign, and written word can thus be very complex; nevertheless, deaf children must master this very relationship if they are to read and write with fluency and precision. In the following section, therefore, we shall attempt to explore further the development of this relationship.

#### The Challenge of Becoming Literate

In the “Prehistory of Written Language” (1978), Vygotsky hypothesizes that, in the process of learning to write, children realize a shift from the drawing of

things to the drawing of words. He characterizes this as a shift from first-order symbolism (symbols that directly denote objects or actions) to second-order symbolism (symbols that represent spoken words). “This means that written language consists of a system of signs that designate the sounds and words of spoken language, which, in turn, are signals for real entities and relations. Gradually this intermediate link, spoken language disappears, and written language is converted into a system of signs that directly symbolize entities and relations between them” (p. 106).

If this is the course followed by the hearing child, how does a deaf child come to understand written language? When deaf children write, it cannot be “a system of signs designating the sounds and words of spoken language” which they are committing to paper; rather it must be the production of signs in a visual/gestural language that they are trying to capture in print. Not surprisingly, then, deaf children face great difficulties as they try to reconstruct the meaning of utterances in ASL in the sequential organization of written words that represents the utterances of spoken English.

In part, these difficulties stem from the fact that deaf children cannot “draw the sounds of speech” in the way Vygotsky describes, as they have little or no real experience with the sounds of spoken English. Being unable to use sound-symbol relationships to map spoken language to print, the deaf child tends to rely on memorized visual patterns of letter strings or words to construct a written text. And, the difficulties become still greater at the level of morphology.

In both ASL and English, the meaning units of language consist of free (lexical) and bound (morphological) morphemes. For hearing children, both of these are directly represented in the phonological-graphological mappings between speech and written text. However, for deaf children attempting to encode ASL morphemes in English print, this is not the case. Often only the free morphemes of ASL are readily represented in the written text. At the lexical level, there is more likely to be some measure of one-to-one correspondence between a distinct sign and a printed word; therefore, the encoding can be relatively direct. But the bound morphemes in ASL are often realized, not through distinct and separate signs, but through a

modulation in the manner or presentation of the base lexical sign. Thus, since there are usually not separate signs for these morphological aspects of ASL, they do not “map onto” English print in any direct way. Therefore, these modulations of meaning are often omitted in the written texts of deaf student writers.

At the syntactic level the differences are even more profound. In spoken English, the semantic relationships between the participants in a sentence are represented through word order or through the addition of prepositions to noun phrases. As these semantic relationships are realized in essentially the same manner in spoken and written English texts—at least in the texts that young children produce—the difficulties in moving from the spoken to the written mode are relatively small. For deaf children, however, these semantic relationships are only partially captured in the order in which the signs are presented in the production of an utterance; to an even greater extent, they are represented through the spatial location in which signs are made, through directionality and through deictic gestures. Consequently, the order of sign presentation in ASL and word order in spoken and written English are not parallel and do not have a one-to-one correspondence, thus creating an encoding challenge for the deaf writer.

Thus, for the deaf child, the movement from inner speech/sign to writing will be very different from, and probably more difficult than, the movement from inner speech/word to writing for the hearing child. For hearing children, Vygotsky contends that spoken language provides the bridge which initially serves to link inner speech to written language. By contrast, clearly, for the majority of profoundly deaf children, spoken language cannot serve to provide this same link. Furthermore, given the profound differences between the ways in which meaning is encoded and communicated in the visual-gestural language of ASL and the auditory-oral language of spoken English, there must be serious doubt about the viability of ASL in creating a similar bridge.

So far, we have been treating written speech as if it were essentially oral speech represented by means of conventional visual symbols. However, despite the interdependence between the spoken and written forms of English, important aspects are quite dissimilar

(Biber, 1986). As a result, as Vygotsky (1987) himself makes clear, writing is far from being simply “speech written down.” Thus, although, as he suggests, spoken language initially provides the bridge from inner speech to written language, there is no guarantee that every hearing child will successfully cross this bridge. How much more difficult the journey must be, therefore, if this spoken language bridge simply does not exist.

Written speech offers no representation of the meanings that, in oral speech, are signalled through intonation and tone of voice. “Written speech is speech in thought, in representations. It lacks the most basic feature of oral speech; it lacks material sound” (Vygotsky, 1987, p. 202). Hearing children struggle with the difficulties of capturing the auditory features and visual-gestural aspects of spoken discourse in their writing. They grapple with the tension inherent in representing both the propositional content and the illocutionary force of the spoken utterance in the written text (Olson, 1977; 1993).

Sign language, by its very nature, relies heavily on its nonmanual (not signed) signals. These nonmanual signals (such as facial expression, eyebrow movements, puffed cheeks, and body position) provide critical semantic and syntactic information in ASL, and the deaf student writer is faced with the problem of how to encode this information in a print form (Paul and Quigley, 1987). While acknowledging that hearing children face a similar problem, it could also be said that they have the advantage first, of already “knowing” the language they are trying to write and, second, of being able to rely on written conventions and structures already standardized as a way to include at least some of the paralinguistic features of spoken English in a written text. Deaf children have much less to build on. They do not “know” the language they are attempting to write, and no system has been standardized for encoding the nonmanual (nonsigned) features of sign, such as a furrowed brow or puffed cheeks, in a written text.

A second critical point that Vygotsky makes is that written speech is speech without the interlocutor present. “Dialogue presupposes visual perception of the interlocutor (of his mimics and gestures), as well as an acoustic perception of speech intonation. This allows

the understanding of thought through hints and allusions" (1987, p. 271). Written speech cannot presuppose any of these things; therefore, to create intersubjectivity and understanding, the writer must rely solely on words—on the appropriate choice of words and on their syntactic organization. In writing, there is no immediate feedback, as there is in spoken dialogue, through a reading of the entire "speech" encounter. Therefore, writing demands an elaboration and expansion of thought and a precision of expression unnecessary in oral speech, and this necessitates the use of a broader lexicon and a greater number of words.

In ASL, much more than in spoken English, the way in which the physical space is used is critical in conveying meaning. In one sense, the signer creates a world in space into which the interlocutor is invited. To take this world and, in the absence of the dynamic interplay with a physically present interlocutor, capture the essence of its meaning on the printed page would seem to be no small challenge for the deaf student writer.

Written speech also differs from oral speech in the much greater abstractness of the way in which it represents experience. In Halliday's (1989) words, "writing creates a world of things; talking creates a world of happenings" (p. 93). In other words, spoken language, by virtue of being in continual interplay with the world of action, reflects a dynamic view of it, which is malleable and constantly changing; by contrast, writing attempts to capture experience in a more definitive, systematic, and permanent representation so that the representation itself can be analyzed, manipulated, and reflected upon. For this reason, compared with speaking, writing can be viewed as less directly tied to immediate experience; intervening between the text and the reality it represents is the "synoptic" system of generalized and decontextualized categories and relationships in terms of which that experience is reinterpreted.

The difference could be described as follows: Commonsense knowledge, as it is encoded in the spoken conversational texts of everyday life, is dynamic in its organization; the meanings foregrounded are those of doings and happenings, which are realized lexicographically in clauses that are congruent, that is to say, where processes and attributes are realized as verbs and adjectives/adverbs. Educational knowledge, on the

other hand, as it is encoded in written texts, is synoptic; the meanings foregrounded are those of structure and stasis, realized lexicographically in texts favoring grammatical metaphor.

From a grammatical point of view, the process involved is typically that of nominalization: the use of a noun or noun phrase to express what, in speech, would typically be represented by a clause containing an agentive subject and a verb of process. For instance, the spoken sentence, "The Trojan people quickly built up the walls of the city again," might, in a written text, become the noun phrase, "The rapid reconstruction of the city walls." By nominalizing the action of "building again" in the noun "reconstruction," most of the remainder of the information in the original sentence can be packed into an expanded noun phrase and this, in turn, can become the subject of a sentence in which the main verb and its complement encode the consequence of that action: "The rapid reconstruction of the city walls ensured the ultimate survival of the Trojan civilization."

What makes the mastery of this kind of writing doubly difficult is that, with this new grammar of written language, comes a new way of thinking; experience initially interpreted dynamically in terms of agents, actions, and objects now has to be reconstrued in terms of the abstract concepts and categories that grammatical metaphor creates. As Halliday puts it, "In a written culture, in which education is part of life, children learn to construe their experience in two complementary modes: the dynamic mode of everyday commonsense grammar and the synoptic mode of the elaborated written grammar" (1993, p. 112). It is not surprising, therefore, that, even for hearing children, the process of learning to read and write academic texts can be both slow and difficult.

But for deaf children, the process is even more arduous, for they face the added challenge of reconstructing, not the natural language of speech, but the natural language grammar of sign in their written texts. Furthermore, because there is no written form of ASL, many of the abstract lexical items created in English through the nominalization process do not have linguistic counterparts in ASL. Thus, where the lexicogrammatical structures of written English can be spoken aloud to aid in understanding their meaning, there



is no corresponding form for them in the medium of sign. Of course, the gist of the meaning of written English can be conveyed through ASL, but it is conveyed in a dynamic rather than a synoptic mode.

Growing Up in a Literate Culture

In the previous sections, drawing on the work of Vygotsky and Halliday, we have compared the linguistic development of deaf and hearing children with respect to some of the key issues raised by a consideration of what it means to become a fully functioning member of a literate culture. This discussion can be usefully summarized, we believe, by restating these issues in terms of four distinguishable, though related and overlapping, phases in children's mastery of their culture's linguistic resources for communicating and thinking. For each of these phases there is a corresponding task: (1) learning the language of the community and, as a result, learning to construe experience dynamically in terms of the categories of the everyday, commonsense grammar; (2) internalizing this linguistic means of making sense of experience so that, in the mode of inner speech, it can function as a tool for thinking and for directing one's own behavior; (3) learning to use the written mode, in which meaning is given a permanent visual representation, so that it can serve as an alternative means of communication; and (4) extending mastery of written language to include the more formal, academic genres and, in the process, reconstruing experience in the synoptic mode and, thereby, appropriating the means for rational, abstract thinking in the medium of inner speech.

In each phase, three conditions need to be met for the relevant development to occur. First, there must be activity settings in which the linguistic activity to be learned plays a significant mediating role. Second, except in phase 2, there must be opportunities for interaction with other people who assist and guide the child in mastering the activity. And third, there must be some way of bridging between already mastered forms of linguistic activity and those to be mastered. With respect to the first two conditions, there is no reason, in principle, to suppose that deaf children fare any better, or worse, than hearing children, although, in practice, deaf children of hearing parents may grow up in environments with significantly less interaction to support their language development (Wood et al., 1986). However, when we focus on the third condition, on the nature of the linguistic medium that provides the bridge in each phase, a significant form of disparity becomes apparent. This can be seen in Figure 1, which, for purposes of exposition, assumes children growing up in an English-speaking culture.

In phase 1, the developmental step the child needs to take is from his or her idiosyncratic protolanguage to the language of his or her community (Halliday, 1975a, 1993). Here the bridge takes the form of the use of the target language in the interactions between the child and his or her parents or other caretakers, as they engage in a wide variety of activities together. For the hearing child, this bridge is spoken English; for the deaf child of deaf parents, it is ASL.

In phase 2, the developmental step is from speech used only in interaction with others to what Vygotsky (1987) called "inner speech," the mode of speech that

Phase	Bridge	
	Hearing	Deaf
1. Learning the first language	Spoken English	ASL
2. Social to Inner Speech	Egocentric Spoken English	Egocentric ASL Sign
3. Inner to Written Speech	Spoken English	?
4. Learning Synoptic Genres	Spoken English	?

Figure 1. Bridges available for hearing and deaf children.

mediates internal verbal thinking. Vygotsky argued that the bridge in this case is egocentric speech—a mode of external speech differentiated from social speech in that it is intended for oneself as opposed to being addressed to others. Over time, the nature of egocentric speech becomes more and more removed in structure from that of social speech and, around the age of six or seven years, it disappears altogether as an external form. However, it does not wither away and die, as Piaget claimed; rather, it develops inwardly and manifests itself in the form of inner speech. Thus, although in nature social speech and inner speech are very different, they are also intimately linked; the existence of the latter depends on the prior existence of the former; and it is egocentric speech that provides the bridge between them. For the hearing child, this takes the form of egocentric speech in English; for the deaf child, the bridge is egocentric signing in ASL.

In phase 3, the developmental step is to master the representation of the meanings generated in inner speech in the external mode of written speech. In Vygotsky's view, this takes place through a transitional use of speech. As he wrote, "understanding of written language is first effected through spoken language, but gradually this path is curtailed and spoken language disappears as the intermediate link" (1978, p. 118). In the development of written language, therefore, it could be argued that external speech serves a similar function to that served by egocentric speech in the development of inner speech: it initially provides the bridge from inner speech to the composition of text directly in written speech. In the case of the hearing child, the strategy he or she uses is that of first composing the text piecemeal in spoken English and then attempting to write down what he or she hears. For the deaf child, however, a comparable bridge is not available. Without access to spoken English, the strategy of first speaking the target phrase or sentence is not available. But signing first in ASL is not a very effective strategy either, for there is no one-to-one correspondence between signed and written phrase, as there is between spoken and written phrases in English.

A similar problem arises in phase 4, where the requirement is to master the synoptic written genres in which discipline-based knowledge is constructed and communicated. Here again, spoken language provides

the bridge for the hearing child. In the case of an already existing written text, this can take the form of an oral reading of the text and of discussion of the text's relationship to what the child already knows and can express in the dynamic mode of everyday speech. Similarly, when writing, through text-focused discussion the hearing child "talks his way in" to making lexical and grammatical choices appropriate to the composition of texts comparable to those he or she has read (Halliday, 1975b; Wells, in press). For the deaf child, however, these spoken language strategies are not available; furthermore, the use of ASL to perform equivalent interpretive functions in interaction with others is also of limited value because, as already pointed out, the very features of the synoptic mode of language use that learners find difficult have no equivalent in ASL.

As the foregoing analysis makes clear, the root of the problems faced by the deaf learner of written English is the incompatibility between the code used in inner speech and the code used in writing. For the hearing community, both inner and written speech, although discontinuous in mode, are based in the code of English; and since both are in different ways derived from spoken English, spoken English can provide the bridge between them. For the Deaf community, by contrast, inner speech and written speech are derived from two radically different codes, ASL and English; and, for this reason, there is no readily available "spoken" mode to form the bridge between them.

The significance of this incompatibility can be clarified by comparing the situation faced by deaf students who are attempting to learn written English with that of hearing students who speak languages, other than English, which have a written mode. The significance of this incompatibility can be highlighted by focusing on the very different bridging strategies available to both groups in phase 3 of development. Even in the case of a language with a very different orthography from English, such as Greek, a plausible route can be suggested from inner speech in L1 to writing in English (L2) that involves no more than one discontinuity, either in mode or in language, at each step along the way (see Figure 2). Note that this hypothetical route assumes that the student first learns to read and write in L1 and so has two sets of bridges to written English: the bridges between inner speech in L1 and

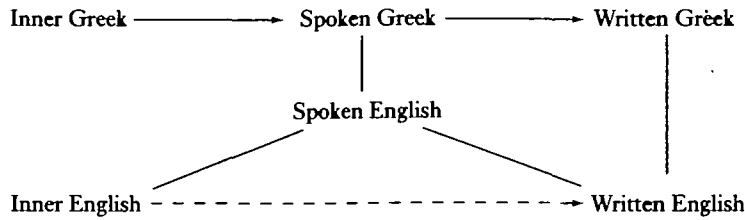


Figure 2. Bridging strategies available to a literate member of L1 learning to read and write English as L2 in phase 3: inner to written speech.

reading and writing in English that become available when he or she learns the spoken mode of English; and the similarities, whatever they may be, between the written modes of L1 and English, including the ways in which the written mode represents the spoken mode in each of the two languages. By contrast, however, because ASL has no written form and because the deaf student does not have access to spoken English, no such route can be established for a learner whose L1 is ASL. For him or her, there is, in effect, a double discontinuity.

#### The Applicability of the Linguistic Interdependence Model

In the preceding analysis, we have drawn substantially on the writings of Vygotsky to show how the problems that deaf students encounter in becoming literate occur precisely because of the nonequivalence of the two language codes that they need to master. Yet these same writings have also been used by others to support the claims for interdependence between ASL and English, on which the bilingual-bicultural approach is based. The question that we must now ask, therefore, is this: How appropriate is the assumption that ASL and written English are interdependent modes of linguistic expression?

Putting the case for interdependence, Rodda et al. (1993), for example, argue that "the development of inner speech through English is not the only way to become linguistically competent" (p. 347). And certainly, this is true—as far as it goes. Keeping in mind the interdependence of inner and social speech, one can reasonably argue that one language is as good as any other for developing "inner speech," that is to say, for developing a medium for intramental verbal thinking. Deaf

children can develop inner speech through ASL, just as hearing children do through spoken English. Further, one could argue very strongly that, for a multitude of reasons, ASL serves this purpose most effectively for a majority of profoundly deaf children.

On the other hand, to show that deaf children can develop inner speech in sign deals only with the first part of the problem. For, even if, in addition, a considerable degree of equivalence is granted, at the lexical level, between sign and written word, there is still the problem of the incompatibility between ASL and written English in their grammatical organization. As Paul et al. (1992) point out, "an unresolved issue for theorists and educators is how deaf students can comprehend phrases, sentences, and other larger units with limited or no access to the phonological code, which has been shown to be important for postlexical access" (p. 92). Bilingual-bicultural advocates would argue that access to the phonological code is not necessary, and that ASL can serve the mediating function between inner speech and written language. However, in light of the arguments we have presented, it seems unlikely that ASL alone can provide the interdependent link, the bridge between inner sign and written English.

A further difficulty with the "linguistic interdependence model" is that functional use in the second language of knowledge acquired in the first is dependent on adequate learning of that second language, which presupposes the necessary conditions. This requirement is stated as follows: "to the extent that instruction in L<sub>x</sub> is effective in promoting proficiency in L<sub>x</sub>, transfer of this proficiency to L<sub>y</sub> will occur provided there is *adequate exposure to L<sub>y</sub>* (either in school or environment) and *adequate motivation to learn L<sub>y</sub>*" (Cummins, 1981, p.29; emphasis added). What is problematic, in the application of the bilingual-bicultural model to

deaf children, is determining what form of exposure will be "adequate" for the learning of English. Clearly, the answer cannot be couched only in terms of quantity—deaf children are constantly surrounded by English print. Even more important, in our view, therefore, is the nature and quality of this exposure.

Some bilingual-bicultural proponents have addressed the issue of quality of exposure by arguing for approaches to English language teaching for deaf children that are holistic, interactive, and meaningful (Ewoldt, 1985). Given the history of very structured models of English language teaching in deaf education, this point is certainly worth emphasizing. It is also consistent with the thinking of both Vygotsky and Halliday. As they both emphasize, "In order to master this new mode (writing), children need to perceive it as functional for them in relation to activities that they find both challenging and personally meaningful. They also need to be given guidance and assistance in carrying out those parts of these activities they are unable to manage on their own" (Wells, 1994, p. 82).

It is also argued that metalinguistic awareness plays an important role when considering the "quality of exposure" to a second language (Gray, 1995). Rather than viewing language as a medium for communication, metalinguistic awareness refers to the ability to look at language itself as an object for reflection and study. It encompasses "the set of terms and concepts which permit the speaker to talk about language in general, rather than its content" (p. 26). Proponents of bilingual education speculate that increased metalinguistic knowledge will help students make and understand the links between ASL and written English.

What has still not been sufficiently considered, however, even in a revised pedagogical model, is the actual nature of the language mode that will mediate effectively for the deaf child between inner sign and written English. In view of the "double discontinuity" arguments presented above, it would seem simplistic in the extreme to suggest that ASL "talk" can simply be substituted for English "talk," as deaf children attempt to co-construct the bridge between talk and text with their teachers. Thus, some form of "English-like signing" seems essential, if deaf children are to master the code that is given representation in written English. But while a variety of possibilities have been mooted,

such as Pidgin Sign English, signed English, or fingerspelling, what would actually "work" remains far from clear. Indeed, research to resolve this question seems to us a matter of the highest priority.

## Conclusion

Over the last two decades, those involved in the field of deaf education have had to contend with issues of ever increasing complexity with respect to language and literacy learning. However, only recently have they looked beyond the field itself to consider the disciplines of psycholinguistics, sociolinguistics, and applied linguistics, and how these might be brought to bear upon the current pedagogical debates concerning the education of deaf students. At this stage, therefore, all concerned must avoid making simplistic generalizations and be both judicious and thoughtful in their attempts to apply theory to practice. In this spirit we have attempted to evaluate the arguments put forward in support of the bilingual-bicultural approach to the education of deaf students by critically examining the appropriateness of using the theory of linguistic interdependence to characterize the relationship between ASL and written English in the developmental trajectories of deaf children.

As we have shown, this theory rests upon a number of assumptions, both about the languages said to be interdependent and about certain characteristics of the language learners. 1) Both languages have a written as well as a spoken mode and the former constitutes a systematic representation of the latter; the two modes are representations of the same underlying linguistic code. 2) In both languages, the external spoken mode can provide a bridge between the mode of inner speech and that of written speech. 3) The learner has already achieved some degree of mastery of the written mode of his or her L1 before attempting to master the written mode of L2. 4) There are adequate opportunities for the learner to become a fluent speaker of L2. 5) In both languages, the written mode is used for a broad range of functions, at least some of which are relevant to the learner's purposes.

Where all these assumptions are met, it is hypothesized that, for a person learning a second language, the two languages may come to be interdependent, thus

allowing his or her command of the spoken mode of L2, together with his or her understanding of the relationship between inner, spoken, and written modes of the L1, to act as bridges in the learning of the written mode of L2. In the case of the deaf student, however, none of these assumptions can be met. And, for this reason, ASL and English cannot be treated as linguistically interdependent. To the extent that the bilingual-bicultural approach to literacy learning for deaf students is based on the application of the linguistic interdependence model, therefore, it is without adequate foundation.

In reaching this conclusion, we are not arguing against the claim that ASL has a central and critical role to play in the education of deaf students. This we take to be beyond challenge. However, we are challenging claims that ASL, when used alone, can bridge the gap between inner sign and written English. For this reason, we disagree with Rodda et al. (1993) who suggest that ASL "can be used as an intralanguage to facilitate the acquisition of a second language" and that "by using the two languages in this way and by using the natural ability of children to code switch, it is in theory, and in a few cases in practice, possible for deaf students to achieve fluency in both languages" (p. 346). To us, such optimism seems based on a very superficial reading of the relevant theory.

Many of the misunderstandings that have occurred in the debate concerning the bilingual-bicultural approach are the result, in our view, of a confusion between the two bridges that the deaf learner needs to establish: the first between external and inner speech, and the second between inner and written speech. While ASL plays a vital and necessary role in the first, its role in the second is much harder to define. Cummins (1989b), in a discussion of the linguistic interdependence principle, explains that a "common underlying proficiency makes possible the transfer of cognitive/academic or literacy-related skills across languages" (p. 44; emphasis added). In the case of the deaf student, ASL can develop the cognitive power that would support broad cognitive and conceptual transfers between ASL and English. However, for the reasons outlined in this article, the possibility of any linguistic transfer or interdependence is unlikely. Further, when the role of ASL in the second framework is ques-

tioned, this is often construed as a challenge to its viability in the first as well. Under these conditions, the arguments generate more heat than light.

By contrast, it would seem to us to be more productive to consider both ASL and English from the perspective of the different roles they have to play in the literacy development of the deaf child. Since both are important in this enterprise, we should be trying to determine which language is the more appropriate given the framework considered. Adopting such a perspective might provide an alternative way of conceptualizing an issue that cannot help but tread on culturally and linguistically sensitive ground.

## Notes

1. Bilingual-bicultural programs for deaf students were established in Europe, in the Scandinavian countries in particular, before they were adopted in the North American context. For the purposes of this article, however, we discuss the North American example in which ASL is the L1 and English is the L2. Nevertheless, we believe the arguments about linguistic interdependence have relevance in contexts outside North America as well.

## References

- Bench, R. J. (1992). *Communication skills in the hearing impaired*. San Diego, California: Whurr Publishers Ltd.
- Bernstein, M. E., & Finnegan, M. S. (1983). Internal speech and the deaf child. *American Annals of the Deaf*, 128, 483-489.
- Biber, D. (1986). Spoken and written textual dimensions in English: Resolving the contradictory findings. *Language*, 62, 384-414.
- Bruner, J. S. (1983). *Child's talk*. New York: Norton.
- California State Department of Education. (1985). *Case studies in bilingual education: First year report*. Federal Grant #G008303723.
- Campbell, R., Burden, V., & Wright, H. (1992). Spelling and speaking in prelingual deafness: Unexpected evidence for isolated 'alphabetic' spelling skills. In C. Sterling and C. Robson (Eds.), *Psychology, spelling and education*. Clevedon: Multilingual Matters.
- Canale, M., Frennette, N., & Belanger, M. (1987). Evaluation of minority students writing in first and second languages. In J. Fine (Ed.), *Second language discourse: A textbook of current research*. Norwood, NJ: Ablex.
- Conrad, R. (1979). *The deaf schoolchild: Language and cognitive function*. London: Harper and Row.
- Cross, T. G. (1978). Mothers' speech and its association with rate of linguistic development in young children. In N. Waterson and C. Snow (Eds.), *The development of communication*. New York: Wiley.

- Cumming, A. (1989). Writing expertise and second-language proficiency. *Language Learning*, 39, 81-141.
- Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In California State Department of Education (Ed.), *Schooling and language minority students: A theoretical framework*. Los Angeles: Evaluation, Dissemination and Assessment Center, California State University.
- Cummins, J. (1983). *Heritage language education: A literature review*. Toronto: Ministry of Education, Ontario.
- Cummins, J. (1984). *Bilingualism and special education: Issues in assessment and pedagogy*. Clevedon: Multilingual Matters.
- Cummins, J. (1989a). A theoretical framework of bilingual special education. *Exceptional Children*, 56, 111-119.
- Cummins, J. (1989b). *Empowering minority students*. California: California Association for Bilingual Education.
- Cummins, J. (1991a). Language development and academic learning. In L. M. Malave and G. Duquette (Eds.), *Language, culture and cognition*. Philadelphia: Multilingual Matters.
- Cummins, J. (1991b). Interdependence of first- and second-language proficiency in bilingual children. In E. Bialystok (Ed.), *Language processing in bilingual children*. Cambridge: Cambridge University Press.
- Cummins, J., Swain, M., Nakajima, K., Handscombe, D., Green, D., & Tran, C. (1984). Linguistic interdependence among Japanese and Vietnamese immigrant students. In C. Rivera (Ed.), *Communicative competence approaches to language proficiency assessment: Research and application*. Clevedon: Multilingual Matters.
- Cummins, J., & Swain, M. (1986). *Bilingualism in education: Aspects of theory, research and practice*. London: Longman.
- Cummins, J., Harley, B., Swain, M., & Allen, P. (1990). Social and individual factors in the development of bilingual proficiency. In B. Harley, P. Allen, J. Cummins, & M. Swain (Eds.), *The development of second language proficiency*. Cambridge: Cambridge University Press.
- Ewoldt, C. (1985). A descriptive study of the developing literacy of young hearing impaired children. *Volta Review*, 87, 109-126.
- Falter, P. (1988). The effect of metalinguistic instruction on the bilingual literacy skills of selected Grade 5 French immersion children. Unpublished doctoral dissertation, University of Toronto, Toronto.
- Furth, H. G. (1973). *Deafness and learning*. Belmont, California: Wadsworth Publishing Company Inc.
- Gates, A. I., & Chase, E. H. (1926). Methods and theories of learning to spell tested by studies of deaf children. *Journal of Educational Psychology*, 17, 289-300.
- Genesee, F. (1979). Acquisition of reading skills in immersion programs. *Foreign Language Annals*, 12, 71-77.
- Goldman, S. R. (1985). *Utilization of knowledge acquired through the first language in comprehending a second language: Narrative composition by Spanish-English speakers*. Report submitted to the US Department of Education.
- Gonzalez, L. A. (1986). The effects of first language education on the second language and academic achievement of Mexican immigrant elementary school children in the United States. Unpublished doctoral dissertation, University of Illinois at Urbana-Champaign.
- Gray, Colin D. (1995). Helping deaf children towards literacy during their primary school years: Which skills should we be fostering? *Journal of the British Association of Teachers of the Deaf*, 19, 22-37.
- Halliday, M. A. K. (1975a). *Learning how to mean*. London: Arnold.
- Halliday, M. A. K. (1975b). Talking one's way in. In A. Davies (Ed.), *Problems of language and learning*. London: Heinemann, 8-26.
- Halliday, M. A. K. (1989). *Spoken and written language*. Oxford: Oxford University Press.
- Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education*, 5, 93-116.
- Hanson, V. (1983). Determinants of spelling ability in deaf and hearing adults: Access to linguistic structure. *Cognition*, 14, 323-343.
- Hanson, V., & Fowler, C. (1987). Phonological coding in word reading: Evidence from hearing and deaf readers. *Memory and Cognition*, 15, 199-207.
- Hoemann, H. W., Andrews, C. E., Florian, V. A., Hoemann, S. A., & Jensema, C. J. (1976). The spelling proficiency of deaf children. *American Annals of the Deaf*, 121, 489-493.
- Israelite, N., Ewoldt, C., & Hoffmeister, R. (1992). *Bilingual-bicultural education for deaf and hard-of-hearing students*. Toronto, Ontario: MGS Publications Services.
- Jamieson, J. (1995). Visible thought; Deaf children's use of signed and spoken private speech. *Sign Language Studies*, 86, 63-79.
- Kelly, Leonard P. (1995). Processing of bottom-up and top-down information by skilled and average deaf readers and implications for Whole Language instruction. *Exceptional Children*, 61, 318-334.
- Klima, E. S., & Bellugi, U. (1979). *The signs of language*. Cambridge, MA: Harvard University Press.
- King, C., & Quigley, S. (1985). *Reading and deafness*. San Diego, CA: College-Hill Press.
- Kress, G. (1982). *Learning to write*. London: Routledge and Kegan Paul.
- Kyle, J. G., Woll, B., with Pullen, G., & Maddix, F. (1985). *Sign language: The study of deaf people and their language*. Cambridge: Cambridge University Press.
- Leybaert, Jacqueline. (1993). Reading in the deaf: The roles of phonological codes. In M. Marschark & M. D. Clark (Eds.), *Psychological perspectives on deafness*. New Jersey: Erlbaum.
- Markides, M. (1976). Comparative linguistic proficiencies of deaf children taught by two different methods of instruction—manual versus oral. *The Teacher of the Deaf*, 74, 307-347.
- Olson, D. (1977). From utterance to text: The bias of language in speech and writing. *Harvard Educational Review*, 47, 257-281.
- Olson, D. (1993). Thinking about thinking: Learning how to take statements and hold beliefs. *Educational Psychologist*, 28, 7-23.
- Ontario Provincial Schools for the Deaf. (1993). *Statement of policy: Bilingual-bicultural education in provincial schools for deaf children*. Toronto, Ontario: Ontario Ministry of Education and Training.
- Paul, P. V. (1992). The use of ASL in teaching reading and writing to deaf students: An interactive theoretical perspective.

- In *Bilingual considerations in the education of deaf students: ASL and English (Conference Proceedings)*. Washington, DC: Gallaudet University.
- Paul, P. V., & Quigley, S. (1987). Using American sign language to teach English. In P. L. McAnally, S. Rose, & S. Quigley (Eds.), *Language learning practices with deaf children*. Boston: Little Brown.
- Rodda, M., & Grove, C. (1987). *Language, cognition and deafness*. New Jersey: Erlbaum.
- Rodda, M., Cumming, C., & Fewer, D. (1993). Memory, learning and language: Implications for deaf education. In M. Marschark, & M. D. Clark (Eds.), *Psychological perspectives on deafness*. New Jersey: Erlbaum.
- Sperling, G. (1978). Future prospects in language and communication for the congenitally deaf. In S. Lieben (Ed.), *Deaf children: Developmental perspectives*. New York: Academic Press.
- Stewart, D. (1993). 'Bi-Bi to MCE?' *American Annals of the Deaf*, 138, 331-337.
- Stokoe, R. (1960). *Sign language structure: Studies in linguistics*. Occasional Paper 8. Buffalo: University of Buffalo Press.
- Templin, M. (1948). A comparison of the spelling achievement of normal and defective hearing subjects. *Journal of Educational Psychology*, 39, 337-346.
- Treger, B., & Wong, B. K. (1984). The relationship between native and second language reading comprehension and second language oral ability. In C. Rivera (Ed.), *Placement procedures in bilingual education: Education and policy issues*. Clevedon: Multilingual Matters.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
- Vygotsky, L. S. (1987). Thought and word. (trans. N. Minnick). In R. W. Rieber & A. S. Carlton (Eds.), *The collected works of L. S. Vygotsky: Volume 1*. New York: Plenum.
- Webster, A. (1986). *Deafness, development and literacy*. London: Methuen.
- Wells, G. (1986). *The meaning makers: Children learning to talk and talking to learn*. Portsmouth, NH: Heinemann.
- Wells, G. (1994). The complementary contributions of Halliday and Vygotsky to a "language-based theory of learning." *Linguistics and education*, 6, 41-90.
- Wells, G. (in press). Text, talk and inquiry: Schooling as semiotic apprenticeship. *Proceedings of the International Language in Education Conference*, Hong Kong, December 1993.
- Wertsch, J. (1985). *Vygotsky and the social formation of mind*. Cambridge: Harvard University Press.
- Wood, D., et al. (1986). *Teaching and talking with deaf children*. New York: Wiley.