

**SEVEN TENSIONS THAT DEFINE RESEARCH
IN BILINGUALISM AND SECOND LANGUAGE ACQUISITION**

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INTRODUCTION

The roots of the study of bilingualism and second language acquisition can be traced to activities in multiple disciplines as well as to catalytic social forces and needs that have arisen from the practice of language education. The primary disciplines involved are linguistics, psychology, anthropology and sociology, with additional contributions from biology. The catalytic educational forces might be differentiated into foreign language education (e.g., teaching of German in the United States), second language education (e.g., teaching of English as a second language to immigrants to the United States, or in areas of the world where English serves important societal functions such as commerce) and bilingual education (use of both languages as a medium of instruction).

At least five major moments during this century can be identified when attention, either through disciplinary changes or practical needs, came to be intensely focused on bilingualism and second language acquisition. The first phase (to be called the "Psychometrics Phase") came in the 1920's during the height of interest in psychometrics and concern about the intellectual character of the "new immigration" (see Hakuta, 1986).

Since most of the new immigrants came from non-English backgrounds, questions arose about the possible effects of bilingualism on intelligence test performance as well as related questions about whether immigrants were learning English and becoming American rapidly enough. Although much of the research from this period is discredited because of unsound sampling and measurement practices, the debate reflected many of the themes that continue to the present day about the nature of language and intelligence, whether they (and other human abilities) are biologically based, and the nature of their relationship.

The second phase (to be called the “Foreign Language Phase”) began in the late 1950’s, stimulated by the Soviet launching of the satellite Sputnik and growing American anxiety about national security and the poor preparedness of the nation in foreign languages. The field of linguistics provided the technical backbone to this movement, and gave rise to a field known as contrastive analysis, in which careful comparisons were made between the grammatical structures of the native language of the learners and the foreign language, with the goal of targeting instruction to those areas where difficulties are predicted (Lado, 1964). This movement resulted in the proliferation of the “audio-lingual” method for teaching foreign languages focused on drilling problematic grammatical patterns, often aided by language laboratory exercises. The audio-lingual method, as Rivers (1964) noted in her incisive review of the field, was thoroughly grounded in the dominant psychological theory of learning which emphasized the formation and interaction of learned habits. As this theory of learning became less acceptable with the advent of cognitive theories starting in the 1960’s, the audiolingual movement ground to a halt.

The third phase (to be called the “Language Acquisition Phase”) came in the 1960’s on the heels of a revolution in our understanding of child language acquisition, which in turn was influenced by a revolution in theoretical linguistics that started with Chomsky’s (1957) Syntactic Structures. Applied linguists such as Pit Corder (1967) who were trying to understand the sources of learner errors in second language learning found many similarities with those being reported in the child language literature -- both seemed to be driven by an attempt to make sense of the target language, rather than being slaves to the native language as contrastive analysis might lead one to believe. Since this time, although the research in first and second language acquisition have tended to be conducted by different groups of researchers in different academic departments, the questions have come to be intertwined: whether the capacity to learn language is best defined as specific to language or reflects general learning mechanisms, and whether there are maturational constraints on language learning capacity.

The fourth phase (to be called the “Canadian Immersion Phase”) also started in the 1960’s, but stemmed from innovations in French immersion education in Canada. French immersion programs were a radical way of responding to the needs of the English-speakers of a bilingual Montreal who wanted to ensure that their children had access to the benefits of bilingualism. In these programs, native English-speaking children were provided instruction exclusively in French from their first day of school (Lambert & Tucker, 1972). This innovation has become very popular in Canada, even in its English-dominant areas, and has generated considerable research on its effectiveness and the conditions under which the

native language and academic achievement are maintained, but with the benefit of becoming highly proficient in a second language.

Finally, beginning in the 1980's, there has been another wave (to be called the "Language Minority Phase") of interest in bilingualism and second language acquisition due to educational needs. This time, however, the needs stem from changes in the immigrant population, especially in industrialized nations (OECD, 1989; Padilla, 1990). This movement has resulted in intense scrutiny of language and educational policies in many developed nations of the world, including the the question of how much emphasis is to be placed on the native language of the students. In comparison to the "additive" bilingual policies pursued in French immersion programs whereby second language learning is an increment to native language development, the policies pursued in general for immigrant language minority students are subtractive in nature. In the United States, for example, most of the official program evaluation research has focused on whether the students in bilingual education programs are learning English fast enough, and under what conditions this process can be optimized; little concern has been shown to their developing bilingual competence. Many basic researchers, on the other hand, have tended to focus on what happens to the native language and ethnic community, often within disciplinary frameworks (e.g., Fishman & Gertner, 1985; Extra & Verhoeven, 1993).

Given this rather complex history of the field of bilingualism and second language acquisition, we have decided to address the task of this review by decomposing the field into key intellectual tensions that we believe capture its character. These tensions reflect historical developments and provide a window into the dynamic process of the research

enterprise as it changes over time. These key tensions are: empiricism vs. nativism; linguistics vs. psychology; psycholinguistics vs. sociolinguistics; cognitive skills vs. whole language; elite vs. folk bilingualism; basic vs. applied research; and theory vs. data. By offering this list of tensions, we do not pretend to exhaust the issues that drive the field, nor do we claim that they are independent of one another. It is from the perspective of these intellectual tensions that one gains the distance to appreciate what is innovative and exciting in empirical research on second language acquisition and bilingualism.

Empiricism vs. Nativism

This classic tension between whether learning is driven by experience or innate knowledge is obviously not unique to the field of second language acquisition. But it is a deeply engrained issue in the field, underscoring how closely the study of bilingualism and second language acquisition is to a very central problem in human learning and development.

Bilingualism and Intelligence

The earliest manifestation of the tension between empiricism and nativism came during the Psychometrics Phase, when there was concern that immigrant children were handicapped in their language growth, as measured by standardized tests of language development, because of their bilingualism (e.g., Smith, 1931). Such a handicap would be predicted, as the empiricists did, if one assumes that there is a direct relationship between time spent on learning and the degree of learning accomplished, for bilinguals would have to divide their learning energy between two languages. This led to the advice commonly

given to immigrant parents not to use the native language at home because it might lead to linguistic retardation (Thompson, 1952).

Radical nativists during this early period went even further and concluded that the poor performance of immigrant children on standardized language tests was not caused by their diffused learning experience, but by genetic inferiority (e.g., Goodenough, 1926; see Hakuta, 1986 for a review).

This line of controversy between proponents of empiricist and nativist views of learning has continued to the present day, but in two different forms. On the one hand, the nature-nurture question over intelligence continues with minimal attention to the question of the role of bilingualism (Jensen, 1980). On the other hand, the issue of the relationship of bilingualism and cognitive development continues as an empirical question, but without making strong assumptions about the nature of either intelligence or bilingualism. This literature generally indicates a mild, positive effect of bilingualism, especially in the areas related to metalinguistic awareness (e.g., Bialystok, 1988).

The Linguistic Abstractness Argument

Another instance of the empiricism-nativism tension can be found in assumptions about what it is that is learned in second language acquisition. This problem has received attention especially in the research during the Language Acquisition phase which went through a period of intense appreciation for the uniqueness of language. This view of language (a characteristic that Chomsky [1965] called “task-specificity”, and the philosopher Jerry Fodor [1983] calls “modularity”) is based on logical arguments based on theoretical

linguistics, as well as behavioral and neurological evidence suggesting that humans process language in specialized ways.

The logical linguistic argument is covered in greater detail in the next section on linguistics and psychology. Briefly, the gist is that all mature speakers of a language have knowledge about their language that is highly abstract. This can be proven by showing that people are able to distinguish between grammatical and ungrammatical sentences that differ only along this abstract dimension. The logical argument is that this ability could not have been induced from simple exposure to the surface patterns of the language. The only way in which they could have gotten to the present state is if they had a critical a priori knowledge about language. Put together with the fact that children display mature knowledge of most aspects of language by age 5, the conclusion is that many aspects of language must be innate. For second language acquisition, the extension is that if learners successfully make similar distinctions, they must also do so following their innate knowledge.

Language as Specialized Behavior

There is a variety of evidence that strongly suggests that language is a special activity unrelated to other human abilities. One such piece of evidence comes from research on the perception of speech sounds. Studies of infant speech perception since Eimas et al (1971) have suggested that very young infants actively segment sounds into phonemic categories even when the acoustic properties of these sounds vary along continuous dimensions. Recent comparative research of infants exposed to Swedish and English showed that these infants had already segmented the vowel continuum in ways that corresponded to the language of exposure (Kuhl et al, 1992).

For second language learners, the evidence suggests that the phonemic categories of the native language serve as a starting point for speech perception of the second language, but that adjustments are made in the course of second language acquisition. Williams (1974) made good use of a difference between Spanish and English in the voice onset time (VOT) speech parameter that distinguishes, for example, between the sounds /ba/ and /pa/. The VOT is the time between the initial release of air from the lips and vibration of the vocal cords. For English, native speakers categorize sounds at VOT less than 25 milliseconds as /ba/ and anything longer as /pa/. For Spanish, the boundary is at about 10 milliseconds. Williams found that Puerto Rican native speakers of Spanish who were learning English shifted from the Spanish boundary to the English boundary both as a function of length of exposure to English and to the initial age at which they were exposed to the second language. Even though the boundary shifted, it is important to note that the subjects preserved the categorical nature of their perception.

Other clear evidence for the special nature of language can be found in the variables that seem to affect the course of language development. Brown (1973) found no effects of parental frequency, reinforcement, or correction on the course of grammatical development. Recently, Marcus *et al* (1993) found that acquisition of regular and irregular past tense marking on verbs is remarkably similar between children learning English and German, despite the fact that irregular verbs are far more common in English, while regular verbs are far more common in German. Such evidence indicates that humans are highly prepared to learn language, and that learning is relatively immune to variations in input language.

Interestingly, there is some evidence to indicate that input frequency is more important in second language acquisition than might be supposed from first language acquisition. Larsen-Freeman (1976) found that the relative frequencies of grammatical morphemes (such as noun and verb inflections, prepositions, the verb to be, and articles) successfully predicted the overall order in which they were mastered by second language learners across a wide range of ages and native language backgrounds. First language learners of English master these same structures in a different order, which is not related to the input frequency, but rather is predicted by their syntactic and semantic complexity (Brown, 1973). The greater sensitivity of second language learners to input frequency, however, does not explain persistent differences between second language learning by native speakers of different languages, such as the great difficulty that native speakers of Japanese have of the English article system, despite the very frequent occurrence of these forms in the English language (Hakuta, 1983).

Age Constraints on Second Language Acquisition

One area that has seen considerable empirical activity is the question of whether there are age constraints on language acquisition. This question is usually viewed from the perspective of neurological bases of language, a perspective that was raised to prominence by Penfield and Roberts (1959) when they reported dramatic results of studies in which they stimulated specific areas of the brain in patients during surgery, and found correlations between areas that were stimulated and language-specific functions. These hardware explanations of language, put together with the obvious plasticity of the brain in childhood, were used to argue for foreign language education in the elementary grades during the

Foreign Language phase of the field. The hypothesis about the age constraints on second language acquisition really took shape with the publication of Lenneberg's (1967) Biological Foundations of Language. Lenneberg brought together the Chomsky-inspired logical linguistic arguments about the necessary abstractness and complexity of language with a review of the evidence on recovery from childhood traumatic aphasia and other disorders that affect language development. The amassed evidence indicated that the potential for language learning existed through childhood but disappeared at around puberty. Lenneberg suggested that the period between birth and puberty constituted a critical period -- perhaps resembling other well-documented cases of critical periods in learning such as imprinting in greylag geese, which is time-bounded and highly prepared learning for specific information (Lorenz, 1958).

The idea of extending the critical period to second language learning has been subjected to empirical test by a number of researchers. The earliest convincing demonstration of an age effect was reported by Oyama (1976) who rated the pronunciation of Italians who had immigrated to the United States at various ages. She found a strong negative effect of age of arrival, and no effect for length of exposure once age of arrival was controlled. Patkowski (1980) examined the syntactic ability of adult learners who had learned English before or after puberty, and found differences in favor of pre-pubescent learners. More recently, Johnson and Newport (1989) looked at the ability to make grammaticality judgments of English sentences by native speakers of Chinese and Korean who had learned English at ages ranging from 3 to 39. Their data suggest the following: (1) there is a decline in accuracy across the age span that begins as early as age 5 and continues

through adulthood; (2) there is greater individual variation among subjects who had arrived after puberty; and (3) the decline in performance is steeper among those who had arrived before puberty than those who had arrived after puberty.

It should be noted that all of these studies have considerable difficulty in controlling for length of exposure to English when they look at age of arrival, especially because the age of subject at the time of testing can become a factor for younger and older subjects. Since these three factors are necessarily related (i.e., current age is the sum of age of arrival and length of exposure), the designs of these studies are never fully satisfactory.

Aside from the inherent empirical blemishes that mark these studies, the results indicate that the question is much more complicated than it appeared at first blush. One complication is that the age-related decline is better characterized as a monotonic in nature, rather than categorical. The ability to learn a second language does not seem to suddenly disappear as might be expected of an ability that is bounded by a critical period, such as the development of the visual system (Hubel, 1988). Even proponents of the biological view readily concede that second language learning might be better described as being affected by a “sensitive period”. Perhaps it is not the withering away of a specific innate capacity. However, if the constraint on learning is really just a decreasing ability that is evidently not specific to language, then the explanation loses much of its original appeal about revealing something about the nature of language.

A second complication arises from the fact that there are many similarities between child and adult second language acquisition. For example, the types of grammatical errors as well as the order of acquisition of grammatical morphemes are not different with respect

to age. Indeed, we are not aware of any reported qualitative differences in the process of second language acquisition in adults and children. To paraphrase the sage observation: if they look like one another, quack like one another, and walk like one another, well then they are probably learning to talk in the second language in the same way. What is lacking is any specification of what might be lost in terms of specific language learning ability as one gets older. Indeed, White and Genesee (1992) recently demonstrated that many advanced adult second language learners master highly abstract grammatical patterns that are thought to be innate properties of the human language capacity.

A final theoretical complication arises from a consideration of whether the process of second language acquisition is at all relevant to the question of a critical or sensitive period for primary language acquisition. All second language learners, by definition, have already acquired a first language. So the notion of a critical period may be applied to second language in different ways, depending on one's theory of what it is that is acquired during second language acquisition.

Under one view, one might suppose that second language acquisition is like re-inventing the wheel, and thus it is a re-run of what happens during first language acquisition. Such a view might be held by theorists who see language acquisition as an essentially concrete, close-to-the-surface event. This interpretation of language acquisition would also be generally compatible with empiricist accounts of language acquisition (e.g., Moerk, 1983). Extending this scenario, one might argue that the tools necessary to invent the wheel might only be available during a critical period, and thus second language acquisition would decline accordingly.

Under another view, one might think of second language acquisition as something only moderately incremental to what one already has accomplished in first language acquisition. Maybe it is more like recycling -- learning new terminology for old concepts, like a Californian who moves to Boston and learns that “regular coffee” comes served with cream and sugar. Such a view can be derived from those who advocate language acquisition to be a highly abstract process consistent with rationalist accounts of the process. Under this view, because the language acquisition ability has already been capacitated in the course of first language acquisition, there may be no age implications for second language acquisition, even if there were indeed a critical period for first language acquisition (see Newport, 1991). Curiously, however, the critical period hypothesis has found its most ardent support among researchers with strong rationalist orientations (e.g., Johnson & Newport, 1989; Long, 1985; Patkowski, 1980).

In sum, there are a number of complications in interpreting the data on age effects on second language acquisition, especially as they might bear on the question of empiricism vs. rationalism. It may well be that until there is better elaboration of the theoretical predictions, the primary reason for investigating the question is simple curiosity and perhaps the need to answer educational policy questions such as the optimum age to begin foreign language instruction.

Linguistics vs. Psychology

The tension between linguistics and psychology has existed since the Language Acquisition phase of research that began in the 1960's. Prior to the Chomskyan revolution in linguistics, there was a fundamental compatibility between linguistics and

psychology, both of which were solidly empiricist in their orientation. Even during the early stages of paradigm change in linguistics, psychologists were enthralled with the possibilities of the new and more powerful linguistics. But efforts to test predictions from linguistic theory failed miserably and psychologists and psycholinguists became disillusioned with the new linguistics. As the distinction between competence and performance became more clearly understood on each side, it became apparent that linguists and psychologists were in pursuit of two different Holy Grails. The linguists were concerned with the linguistic intuitions of an idealized speaker; psychologists were concerned with the behavior of their all-too-real subjects. Nonetheless, researchers investigating bilingualism and second language acquisition have drawn on both linguistics and psychology.

The Linguistic Perspective

On the linguistic side, the dominant current influence is Chomskyan generative grammar. This approach assumes that the first-language learner comes to the acquisition task with innate, specifically linguistic, knowledge, or Universal Grammar. The claim is that certain principles of the human mind are, to a degree, biologically determined and specialized for language learning. As Chomsky put it: “Universal grammar is taken to be the set of properties, conditions, or whatever, that constitute the ‘initial’ state of the language learner, hence the basis on which knowledge of language develops” (1980, 69). These abstract and linguistically significant principles are thought to underlie all natural languages and comprise the essential faculty for language with which all individuals are in general uniformly and equally endowed.

According to this theory, the ability to acquire a human language is genetically determined. The theory postulates that the child faces a “projection problem” in that the language learning task must be accomplished with deficient input. The only way to explain how children succeed is to assume that they approach the task endowed with a Universal Grammar that comprises a rich set of innate principles that govern the emergence of language. Universal Grammar constrains the hypotheses that children make and the child’s language environment determines which principles of the Universal Grammar will be accessed. Acquisition involves setting the parameters in a specific way to reflect the properties of the grammar of a particular language.

As a linguistic theory, Universal Grammar does not concern itself with second-language acquisition. Nonetheless, a number of second language researchers have applied the theory in their work, motivated by the need for a sufficiently sophisticated linguistic theory to describe the complex structural characteristics of the learner’s language. Universal Grammar, its proponents argue, provides a detailed *linguistic theory to account for second-language phenomena.*

Second-language learners are thought to face the same “projection problem” (White, 1985)--that is, they, like first-language learners, have to work out a complex grammar on the basis of deficient data. The learner’s grammatical knowledge cannot be explained by the input alone. Felix (1984) listed three limitations to such an explanation. First, some structures are so rare and marginal that it would not be possible for learners to obtain sufficient exposure to them. Second, incorrect hypotheses require negative feedback (correction, identification of errors, etc.) if they are to be discarded, but such

feedback usually does not occur. Finally, the rules of any grammar are highly abstract and so do not reflect the surface properties of the language.

According to the theory, Universal Grammar involves a set of principles with certain parameters. These parameters remain “open” until they are set by experience with the environment. For Chomsky, language acquisition is not so much a problem of acquiring grammatical rules, but rather a process whereby the learner discovers how the principles operate in the target language and what parameter values apply. The grammar of a language is the set of values it assigns to various parameters. As Chomsky put it, “Experience is required to set the switches. Once they are set, the system functions” (1984, 25).

An oft-cited example of such a parameter is the pro-drop parameter, which specifies that languages vary with regard to whether they allow the deletion of pronouns in subject position, together with related phenomena such as inversion of subject and verb. English does not have pro-drop because a subject is required for every sentence and the subject cannot be inverted with the verb in declarative sentences. This is not true of Spanish, however, which, as a pro-drop language, allows empty subjects and subject-verb inversion in declarative sentences.

Another example is the principle of adjacency, according to which noun phrases must be next to the verb or preposition that gives them case. Hence in English an adverb cannot intervene between a verb and its direct object. Sentences such as “Mary ate quickly her dinner” are not allowed, whereas in French such sentences are permitted: “Marie a mange rapidement le diner” (White, 1989). The French option is assumed to

be “set” for the child learning French as a first language on the basis of positive evidence in the form of such sentences.

The crucial issue in much linguistically-based second-language research is how the parameters that have been set in the first language need to be reset or readjusted for the second language. Some investigators argue that Universal Grammar principles are fully available to the learner and the task of second-language learning involves resetting the first-language parameters in line with those of the second. The relative similarity or difference of specific parameters across the learner’s first and second languages will then constrain this “resetting” process (Flynn, 1984).

Other researchers maintain that Universal Grammar principles are available, but that they interact with, and are highly constrained by other factors--e.g., cognitive strategies, processing considerations (Bley-Vroman, Felix, & Ioup, 1988). Bley-Vroman (1990) has argued that the child language learner possess a language acquisition system that contains the following two subcomponents: (1) a definition of possible grammar: a Universal Grammar, and (2) a way of arriving at a grammar based on available data: a Learning Procedure (or set of procedures). The adult second-language learner, Bley-Vroman argued, does not have access to Universal Grammar, but instead constructs a kind of surrogate for Universal Grammar from knowledge of the native language. This knowledge, plus general cognitive abilities that enable adult learners to deal with abstract formal systems, enables adult learners to acquire imperfect knowledge of target languages.

The Psychological Perspective

The Bley-Vroman position accords well with what most psychologists and psycholinguistics would maintain about second-language learning. The contention is that there may be some access to Universal Grammar through knowledge of the first language and adult second-language learning is the result of this knowledge and general cognitive abilities. From this perspective second-language learning, like all adult cognitive problem solving, is goal-oriented, involves analysis, hypothesis formation and testing, and analogy. The learner is thought to proceed with practice from attention-demanding, controlled processing to more automatic processing.

Second-language theorists and researchers have drawn from cognitive psychological work in general problem solving, schema theory, and production models. For example, O'Malley and Chamot (1989) used Anderson's (1983) notions of declarative and procedural knowledge to express the manner in which information about language is represented in memory. Kennedy (1988) made a similar distinction based on Gagne's (1985) information-processing model. Both approaches stress the difference between knowing concepts, propositions, and schemata (declarative knowledge) and knowing how to perceive and classify patterns and how to follow specific steps until an end goal is reached (procedural knowledge). A related distinction is made by Bialystok (1981), who uses the concepts "analysis" and "control" to distinguish between the cognitive skills involved in the learner's linguistic knowledge from skills involved in control of processing.

Procedural knowledge is thought to be acquired through extensive practice and feedback and, once learned, is more easily activated in memory than declarative

knowledge. Initially, the learning of procedures requires conscious attention, but as the learner becomes more and more skilled at a task, less conscious work is required. McLaughlin, Rossman, and McLeod (1983) used Shiffrin and Schneider's (1977) distinction between controlled and automatic processing to account for this progression from a more cognitively demanding to an autonomous stage of learning.

As performance becomes more automatic, elements of the task become unitized (Gagne 1985). That is, there is an integration of skills into larger and more efficient units. This unitization process involves a progressive reorganization of information as an increasing number of procedures become automatic and controlled processes are freed for new tasks. In the case of second-language learning there is constant restructuring as learners simplify, unify, and gain increasing control over the procedures involved in processing the language (McLaughlin 1990).

Another area of cognitive psychology that has impacted on second-language research concerns expert-novice systems. The literature suggests that "experts" use *different information processing strategies than do more "novice" learners*. Differences between experts and novices have been found in research on learning mechanisms in physics, arithmetic, algebra, geometry, computer programming, and chess. For the most part, research indicates that experts restructure the elements of a learning task into abstract schemata that are not available to novices, who focus principally on the surface elements of a task. Thus experts replace complex sub-elements with single schemata that allow more abstract processing.

In the realm of language learning, experts are those individuals who have learned a number of languages. There is considerable anecdotal evidence (though little empirical research) that suggests that once a person has learned a few languages, subsequent language learning is greatly facilitated. In a study using a miniature artificial linguistic system, Nayak, Hansen, Kreuger, and McLaughlin (1990) found that multilingual subjects showed more flexibility in switching strategies than did monolingual subjects. This is consistent with the research of Nation and McLaughlin (1986), who found that multilingual subjects were able to avoid perseveration errors more than were other subjects in their experiment. Similarly, Ramsey (1980) reported that multilingual subjects demonstrated greater flexibility in “restructuring mental frameworks” than did monolingual subjects. Thus there is some evidence to suggest that more expert language learners show greater plasticity in restructuring their internal representations of the rules governing linguistic input.

In other research within an “expert systems” framework, Faerch and Kasper (1983), McGroarty (1989), Oxford (1986), and O’Malley and Chamot (1989) have attempted to specify strategies that good language learners use. The ultimate goal of much of this research has been to expand and refine the repertoire of strategies of poor learners so that they may benefit from strategies used to good effect by “expert” learners. Wenden (1987) noted that intervention research on training learners to use cognitive strategies in other skill areas has demonstrated that the appropriate use of strategies in a variety of situations requires metacognition. It is not enough for learners

to be trained to use a particular strategy, they must also understand the significance of the strategy and be able to monitor and evaluate its use.

Research on learner strategies and the cognitive approach generally fit well with the needs of classroom teachers. Contemporary linguistic theory with its concern with abstract principles is arcane and inaccessible to teachers. Most teachers are more comfortable with an approach that sees language learning as an active process of internalization, through practice, of various rules and representations. Teachers are at home with a theory that is concerned with learning, production, and communication strategies. Nonetheless, the insights of contemporary linguistics have had a powerful effect on thinking about how languages are acquired. It remains to be seen whether these insights will be useful to classroom teachers.

Psycholinguistics vs. Sociolinguistics

The psycholinguistic perspective dates back to the Language Acquisition phase of the 1960s and 1970s, especially early work on “error analysis” and the “morpheme” studies (Ellis, 1985; Hatch, 1983). Here we will focus on two contemporary manifestations of the psycholinguistic approach--work on the “Competition Model” and work using miniature artificial languages. The sociolinguistic perspective stresses the social nature of language and its use in varying contexts, and in many ways defined itself as a reaction to the dominance of psycholinguistics. According to this view, the psycholinguistic experiment is only one of many possible contexts in which language is used, and, consequently, does not tell the whole story. Sociolinguists argue that how a person uses the language will depend on what is understood to be appropriate in a given

social setting. Sociolinguists see linguistic knowledge as situated not in the individual psyche, but in a group's collective linguistic norms.

The Psycholinguistic Perspective

One of the ways to study how individuals learn a second language is to examine how the ways in which language is used affects how grammatical forms are acquired. This is the question of “form-function mappings” that is central to a popular research paradigm developed by Bates, MacWhinney, and their colleagues (Bates and MacWhinney 1982; MacWhinney, Bates, and Kliegl 1984). Their model is called the Competition Model, and it assumes that the structural properties of language are represented not in terms of rules (explicit or otherwise), but rather by mappings between surface linguistic forms and underlying functions. In any given language, a particular instantiation of a form-function mapping is assigned a weight depending on how often and how reliably a given form is used to perform a given function. The information a learner uses to decide which function is meant to be expressed by a particular form is referred to as a “cue,” and cues vary in their reliability and availability.

In the second-language context, the task facing the learner is to discover how specific forms are used for specific functions in the new language. Typical experiments testing this model use bilingual subjects in a within-subjects, cross-language design. Subjects are given a sentence interpretation task designed to produce “competitions” among a restricted set of grammatical cues (e.g., word order, animacy relations, subject-verb agreement, and case inflections). The task is to say which noun is the agent of the action. For example, subjects may hear, “The apple is eating the man.” In this

example the canonical SVO pattern of English is in competition with the animacy cue. Studies comparing different groups of bilingual subjects suggest that during the initial period of second-language acquisition, subjects rely on the transfer of first-language strategies to aid sentence competition. Thus Italian and Japanese subjects learning English tend to rely on the animacy cue rather than using the word order cue, which is the processing strategy employed by native English speakers (Gass 1987; Harrington 1987).

From experiments using various combinations of competing cues advocates of this approach argue that it is possible to examine which cues are most important in sentence comprehension in a language, and how certain cues come under strategic control as fluency increases. This would have important pedagogical implications, as it is these cues that would be critical for learners coming from particular background languages and teachers could attend to such cues in teaching these learners.

Recently, however, Gibson (1992) has raised the question of the adequacy of the *definitions of key concepts in the competition model*, especially the notion of “cue” and cue reliability and validity. Gibson argues that insufficient attention has been paid to how cues are identified and used by learners. He also argues that the experimental paradigm used to support the model may tap into different processing mechanisms--specifically, if a given stimulus string is grammatical in a language, it may be processed differently than are ungrammatical strings.

One wonders, moreover, about the “ecological validity” of an experimental procedure in which subjects have to make decisions about sentences that are as deviant

as “The apple is eating the man” is in English (McLaughlin & Harrington, 1990). Perhaps subjects are not processing such sentences as they would in actual communicative situations, but are settling on a particular problem-solving strategy to get them through the many judgments of this nature they have to make. One particularly disturbing finding from the competition model is that there is a great deal of L1 transfer, whereas most naturalistic research reveals surprisingly little L1 transfer (McLaughlin, 1986). As MacWhinney and Bates (1989) noted, it is important for testing the adequacy of the Competition Model to develop more on-line measures of sentence processing, both with respect to comprehension and production.

Another psycholinguistic research method that is widely used in current second-language research involves the use of miniature artificial languages (MALs). Because natural language learning takes place in an environment where it is impossible to control the input the learner receives, researchers have not been able to specify as accurately and exhaustively as possible those features of the environment that causally influence learning. By clearly specifying the input and output characteristics of the language acquisition task through the use of MALs, it becomes possible to make systematic inferences about the structures and processes within the organism that make learning a language possible.

Artificial linguistic systems resemble natural languages in that they contain a set of verbal symbols and a set of rules for combining these symbols into sentences. Like natural languages, the set of rules can specify class membership, order, and co-occurrence constraints on the linguistic structure of the artificial language. Unlike

natural languages this set of rules is fairly limited in scope, thus making it possible to observe a language-learning situation wherein various language features can be studied in isolation from the complex interactions found in natural systems. It is this ability to manipulate systematically all features that might influence language learning mechanisms that makes the study of artificial linguistic systems an important tool in psycholinguistic research (Moeser, 1977; Morgan and Newport, 1981).

Subjects in an experiment using an artificial linguistic system are exposed to a limited subset of permissible strings. The question of interest is whether they can apply generalizations derived from the learned subset to novel strings and if so, what is the nature of these generalizations. In a number of papers based on MAL research, Reber and his associates (e.g., Reber, 1976; Reber & Allen, 1978) have argued for what they have called "implicit learning." In this research, subjects were exposed to finite-state grammars, made up of letter strings, and were found to be significantly accurate when they subsequently have an opportunity to judge the grammaticality of novel grammatical and non-grammatical strings. Because subjects seemed to be learning these rules without being able to articulate their knowledge, Reber concluded that the learning was implicit and unconscious.

This conclusion has been challenged by Dulany and his associates (Dulany, Carlson, & Dewey, 1984), who questioned the degree to which the knowledge of subjects in these experiments is properly characterized as abstract and the degree to which it is truly unconsciously held. Their research indicated that subjects developed personal and idiosyncratic sets of rules and that these sets of rules correlated with the finite-state

grammar in the sense that both sets of rules resulted in the same grammatical classifications. The subjects' idiosyncratic rules were of imperfect validity and of limited scope, but were accessible to consciousness. This is an important pedagogical point, as there are some (e.g., Krashen, 1982) who argue that second-language learning is largely an "unconscious" process, and others (e.g., Schmidt, 1990) who maintain that what is learned has to be "noticed."

The critics of research with MALs question whether the abilities recruited in such experiments are the same as those engaged in natural language learning, specifically those recruited when a child is acquiring a first language. McLaughlin (1980) has argued that because subjects learning artificial linguistic systems are not linguistically naive, research on artificial linguistic systems, rather than being viewed as a method for understanding the nature of first-language acquisition, is more suited to further our knowledge of the process of second-language learning. In fact, as some research suggests (Nation & McLaughlin, 1986; Nayak, Hansen, Krueger, & McLaughlin, 1990), the amount of exposure that subjects have had to various natural language systems may be a critical factor in how they go about learning a new linguistic system.

Research on the Competition Model and on miniature artificial languages are instances of the psycholinguistic approach, in that studies are typically tightly controlled and take place in a laboratory setting. Sociolinguists argue that this is not the way to obtain good data on the learner's abilities. One has to go beyond the laboratory and examine systematically how language is used in various settings.

The Sociolinguistic Perspective

One of the axioms of the sociolinguistic perspective is that speakers have several “styles” that they use according to the demands of the social context. The “vernacular” style is associated with informal, everyday speech. It requires minimal attention and is at the opposite end of the continuum from language used in formal situations where speech is highly monitored.

The classic research is Labov’s (1970) study of the speech patterns of New Yorkers. He sampled speech styles that ranged from casual speech to carefully monitored speech. It was possible to characterize different styles of speaking in terms of the variable use of such sounds as the th in ‘thing.’ In more casual speech, he found a greater use of non-prestige variants of th, such as /t/.

Similar research with second-language learners (Dickerson, 1975; Schmidt, 1977; Tarone, 1983) indicates that language learners also show contextual variability according to linguistic setting. There is a continuum of usage with one end represented by the vernacular style, which is seen when the learner is not attending to speech. At the other end is the careful style, which involves close attention to speech. Tarone called this the “interlanguage continuum.” It reflects the fact that differing degrees of attention are required for different performance tasks.

Tarone (1983) argued that second-language learners have variable capability and that this is a better description theoretically than a Chomskyan competence model. This variable capability underlies all interlanguage behavior and is due, ultimately, to the differential attention to language in different tasks. Ellis (1985), like Tarone, maintained that interlanguage output is best described by a continuum ranging from planned

discourse to unplanned discourse, but he differs from Tarone in distinguishing “non-systematic” and “systematic” variability. The first includes free variation or unpredictable variability; the second is similar to the variability described by Labov and Tarone.

The views of Tarone and Ellis have been criticized on theoretical grounds by Gregg (1990) who argued that variationist models of second-language acquisition are inherently incapable of accounting for the phenomena they are invoked to explain. An adequate theory, such as Universal Grammar, is a model of linguistic competence based on principles and parameters. For Gregg, variation exists, but it is not interesting; indeed, it is not something that a theory of acquisition need be concerned with. It is a pesky mosquito that is best ignored.

Preston (1993) took a different tact. He is uncomfortable with free or unpredictable variation and argues that all variation is systematic. For him, the task for sociolinguistics is to determine the probabilistic weightings of influences on varying forms that occur in language usage. Preston’s approach requires multivariate analysis of factors that affect the occurrence of one form or another. This work is especially promising as a way of linking sociolinguistic and psycholinguistic concerns. As Preston argued, it provides quantifiable features that make a storage-production psycholinguistic model possible--at least in principle. Thus, to some extent there is a convergence of interests, as both psycholinguists and sociolinguists such as Preston are concerned with determining what are the important features influencing language use and how these features get added in a predictive equation.

Other lines of sociolinguistic research examine the social nature of language acquisition and the roles that other individuals play in the language learning process. Many immigrant children come from communities where horizontal peer-to-peer interaction patterns are much more common than vertical adult-child patterns (Brent-Palmer, 1979). Furthermore, the experience of many immigrant children in the home is that learning occurs through observation and nonverbal means, rather than through language. There is none of the information testing through questions that characterizes the teaching-learning process in American middle-class homes (Edelsky, et al., 1983).

Such observations have important pedagogical implications for the child's school achievement (Padilla, 1990). Public education in Europe and the United States is geared to the middle-class child, and most teachers incorporate middle-class values in their lessons. Many of the problems of immigrant working-class children in the public school system derive from the discontinuity between their values and communicative norms and those of the school (Brent-Palmer, 1979; Delpit, 1986; Extra & Verhoeven, 1993).

Cognitive Skills vs. Whole Language

Part of the Language Acquisition Phase of the 1960s and 1970s involved a rejection of traditional behavioristic notions of human psychology and the adoption of the new "cognitive psychology." This approach has become the dominant paradigm in present-day psychology, with implications to second-language research as well. It is not without its detractors, however, many of whom are part of what has become known as the "whole language" movement.

For researchers working within the framework of contemporary cognitive psychology, second-language learning is one of many complex cognitive skills and is learned in a similar fashion. Initially the learner is overwhelmed by the sheer number of tasks that have to be performed in speaking a second language--correct articulation of sounds, correct lexical choice, correct grammar. But with practice, it becomes easier to pronounce the sounds of the language correctly and more attention can be given to correct word choice and grammar.

For advocates of the whole language approach, this view of learning is overly simplistic and leads to a fragmentation of the learning process into discrete, isolated tasks. It leads to a deadening pedagogy that focuses on skills rather than engaging the learner. Focusing on skills is especially detrimental to the education of language minority children learning English in America's schools. In the whole language approach, meaning is essential and the learning of skills is subordinated to the task of making learning meaningful to the student.

The Cognitive Skills Approach

In what follows, we will focus on a particular task, that of learning to read in a second language. Reading can be viewed as a cognitive skill; indeed, as the most complex and difficult of all the cognitive skills that the child must master in school. The child who accurately and efficiently translates a string of printed letters into meaningful communication may appear to be accomplishing that task with little mental effort. In fact, from a cognitive skills perspective, the child is engaging in complex interactive processes that are dependent on multiple subskills and an enormous amount of coded

information. The fluent reader must have automated language skills, intact visual and auditory memory, the ability to associate and integrate intra- and intermodal stimuli, and the ability to abstract and generalize patterned or rule-generated information (Vellutino & Scanlon, 1982).

More specifically, to become an accomplished reader, the child must have mastered three important tasks that are developmentally linked to each other. Only after the child has automated word-decoding operations, is it possible to acquire more sophisticated reading and comprehension skills. Similarly, the automation of word-decoding skills is dependent on mastery of symbol-sound correspondence rules.

Research by cognitive psychologists with good and poor readers has indicated that certain components of the reading process are more advanced in good than in poor readers. Specifically, good readers are distinguished from poor readers by:

Bottom-up skills:

- superior ability to store information in short-term memory.
- superiority in visual discrimination.
- superior phonological analysis skills.
- superior attentional abilities.

Top-down skills:

- superior ability to use syntactic knowledge.
- superior semantic knowledge and ability to use

context.

- superior ability to go beyond the single sentence in drawing inferences about the story line.

It seems reasonable to argue that the cognitive skills required in reading are difficult tasks for second-language learners to master and often lead to frustration and school failure.

A crucial period is the late elementary grades. It is at this time that children typically read reasonably smoothly in units larger than individual words, but are not yet fully mature and skilled readers (Gibson & Levin, 1975). The jump to mastery in reading requires that the child learn how to extract meaning quickly from text--a task that assumes that words are decoded quickly enough to allow space in working memory for retaining the evolving meanings (LaBerge & Samuels, 1974; Perfetti & Hogaboam, 1975). Poor readers may be hampered in achieving comprehension by their inability to achieve automatic word-decoding or even by non-automatic symbol-sound matching.

Reading a second language requires all these “bottom-up” skills. Furthermore, children who are learning to read in a second language may have more problems than monolingual children because of their lack of familiarity with the semantic and syntactic constraints of the target language. If children are not able spontaneously to identify and exploit syntactic relations and are not flexible in their use of semantic context as a guide to prediction, their reading comprehension and speed decline (Carr, 1981).

The Whole Language Approach

Focus on such “bottom-up” skills is anathema to advocates of the whole language approach. They view such efforts as fragmentary and reductionistic. The emphasis in the whole language approach is on making reading meaningful and on involving students personally. Language should not be taught piecemeal, but as the essential focus of the entire curriculum. Thematic instruction makes reading an integral part of instruction, not a subject matter of its own.

Whereas the traditional cognitive approach views the teacher as an expert and the students as apprentices, the whole language approach sees the teacher as a facilitator and the student as defining the task of making meanings. The traditional approach tends to view the skills involved in reading as developmentally sequenced, whereas in the whole language approach a skill is taught when a particular child needs it for something that the child is working on. Literacy skills are seen as interrelated in the whole language approach; oral skills need not be fully developed before reading, nor does reading necessarily precede writing.

The whole language movement is more than a theory of language learning; it represents a philosophical stance on education and makes a political statement regarding the distribution of power (Edelsky, 1990). It sees education as a socially and culturally shared activity and asks how literacy is socially constructed in the classroom. Students need to be empowered so that they value their own experiences, communities, and cultures.

The whole language movement has impacted more traditional views of literacy instruction. For example, Means and Knapp (1991), in a discussion of how the cognitive

approach applies to children from culturally diverse backgrounds, argue that curricular changes need to have a focus on complex, meaningful problems and that connections should be made with students' out-of-school experience and culture. While stressing the importance of modelling powerful thinking strategies and providing scaffolding to enable students to accomplish complex tasks, these authors also note the importance of encouraging multiple approaches and solutions and making dialogue the central medium for teaching and learning. Similarly, in a recent discussion of methods of teaching comprehension strategies, Harris and Graham (1992) noted that such instruction must take place in appropriately meaningful contexts and environments.

In the area of writing similar efforts have been made to place the construction of meaning at the center of the curriculum and to make writing integral to all instruction. This movement views writing as a process, and has been brought into the class-room by the National Writing Project and the Writing Project of the University of California. The writing process approach is used widely with mainstream children and has been applied in some contexts to language minority children (Gutierrez, 1992).

In a review of the research base of the whole language approach, Pearson and Raphael (1991) noted that several features of the whole language model have been positively associated with successful literacy instruction. For example, there is considerable evidence that reading literature results in better reading comprehension than does isolated skill practice. Similarly, research has indicated that the quality and quantity of children's writing are improved when they are encouraged to participate in wide-ranging, unfettered writing activities from the outset of schooling. In addition, reliance on

authentic functional literacy tasks has been shown to develop a more realistic view of the uses of reading and writing.

There is also evidence that the whole language approach reduces the cultural mismatch that frequently occurs in classrooms with children from linguistically and culturally diverse backgrounds because the students and not the teacher define the context of the learning situation. However, there are also unanswered questions about the effectiveness of reform efforts in teaching literacy skills to ethnic and language minority children. Delpit (1986) and others have been critical of the effects of writing process instruction on minority children. The concern is that such methods do not allow students to learn and produce the type of discourse upon which assessment is based--i.e., standard academic discourse.

A number of authors have recently attempted to reconcile whole language and more traditional cognitive approaches (e.g., Garcia & Pearson, 1990; McKenna, Robinson, & Miller, 1990). However, Edelsky (1990) and others have argued that such attempts are futile and that whole language represents a paradigm shift. Attempts, for example, to use traditional assessment instruments as outcome measures to determine instructional effectiveness are regarded by whole language advocates as instances of paradigm blindness. Reliance on test score data is seen by whole language advocates as reinforcing mechanisms for stratifying society--i.e., test score-based tracking.

Whether these conflicting views can be reconciled remains to be seen. However, regardless of whether researchers use the more qualitative methods of the whole language paradigm or more traditional quantitative methods, it is important to determine

under what conditions innovative instructions are effective with language minority students. Especially in the late elementary grades, where literacy skills are central to academic success for these children, there few more important educational challenges.

Elite vs. Folk Bilingualism

Fishman (1977) draws a key distinction between situations where bilingualism is a goal for the elite or, simply a predicament of the common folk. Other related terminology that has been offered include additive vs. subtractive bilingualism (Lambert, 1975) and elective vs. circumstantial bilingualism (Valdes, 1992). The distinction between different situations of bilingualism, especially as it pertains to the status of the groups, is useful in understanding the orientation of researchers working in the different phases, as well as in sorting through conflicting findings and conclusions (Hakuta, 1986).

The teaching of a second language applied to the “elite” has been the main preoccupation of the Foreign Language and the Canadian Immersion phases of research. In these situations, the problem to be solved is how to most creatively or intensely teach the second language because of the needs of the middle and upper classes. During the Foreign Language phase, the need was international competitiveness. In the case of the Canadian immersion programs, the main proponents were middle class Anglophone parents who sensed opportunities for their children if they learned French in a society that is officially bilingual. In both cases, the status of the native language is never questioned, and the desirable goal is bilingualism.

During the Psychometric and Language Minority phases, on the other hand, attention has been on the population of students who are usually immigrants and of the

“folk” variety. The main social question is whether the immigrants are learning English fast enough; there is an attitude of benign neglect or outright hostility toward the native language, often accompanied by a fear of permanent ethnolinguistic ghettos that could lead to social fragmentation. In the Psychometric phase during the early part of this century, researchers used the yardstick of standardized intelligence tests to see whether the new immigrants were sizing up to the old (Hakuta, 1986). And in the current Language Minority Phase, researchers have tended to measure it in the speed of English proficiency development and measures of school achievement. In these settings, the status of the native language is marginal, and while it might be acceptable if the language were maintained in the home, bilingualism is not a desirable goal (Imhoff, 1990).

As Hakuta (1986) has documented, the social status of the subject population as well as the social values of the researcher conducting the studies have led to very different conclusions about the effects of bilingualism on intelligence. During the Psychometric Phase, the studies mainly concluded that when bilingual subjects were compared with monolingual controls, the bilinguals performed worse than the monolinguals on various standardized tests of intelligence. On the other hand, much of the research with elite bilingualism indicate that the cognitive and linguistic outcomes are positive. Thus, bilingualism might be considered good for the elite, bad for the folks. In reconciling contradictory evidence, a key is to locate the exact explanatory level where the differences might be reconciled.

Cummins (1976) surveyed research with both folk and elite bilinguals on the effects of bilingualism and hypothesized that the key mediator was whether a “threshold” level of bilingualism had been attained. The threshold hypothesis states that positive outcomes result only when children have attained a high level of functioning in two languages. In contrast, in situations of folk bilingualism in which the first language is compromised, such as that found in immigrants who replace their native language with the second language, negative consequences would result. The locus question is whether the appropriate explanatory factor is a cognitive one in which the level of bilingualism attained that is in turn determined by the sociological circumstances of language status, or whether it is alternatively a sociological one in which status affects both linguistic and psychological conclusions. The threshold hypothesis places the locus at the cognitive level.

The theoretical perspective on language implied by the threshold hypothesis has been attacked, from the sociological perspective, for implicitly legitimizing the notion of “semilingualism” (Edelsky *et al.*, 1983; Cummins & Swain, 1983), a condition in which the child develops full proficiency in neither language (Skutnabb-Kangas & Toukomaa, 1976; see Romaine, 1989). Whether semilingualism is a valid concept at the cognitive level is a matter of great controversy (Paulston, 1982).

The roots of this controversy over the ontological status of semilingualism refer back to a fundamental issue of whether certain socially accepted linguistic codes can be inherently limited in their functioning. The controversy parallels the debate on Black English of the 1960’s on whether the vernacular was simply a degraded version of

standard English or possessed its own integrity as a linguistic system (Labov, 1972). It also parallels the debate over code-switching in bilinguals and whether the phenomenon demonstrates linguistic confusion or a controlled form of expression (Zentella, 1981). In the view of some critics of the concept of semilingualism, there is nothing deficient in the language of folk bilinguals, and insisting on its existence merely reflects middle class bias (Brent-Palmer, 1979). Thus, the locus of explanation in their view is social bias against lower class immigrants and the acceptance of linguistic and cognitive measures that are not valid.

Bridges between Elite and Folk Bilingualism

It is our view that basic psychological and linguistic processes are not fundamentally different between elite and folk bilinguals. Error and performance analysis of the acquisition of second language grammar, for example, do not indicate any systematic differences between studies conducted with elite or folk bilinguals. We subscribe to what John Macnamara (1976) once said about language acquisition: “when an infant, a ten-year-old child, and an adult learn Russian, the most remarkable outcome is Russian” (P. 175). The cognitive and linguistic mechanisms for learning language are universally available and are unlikely to be incapacitated in most circumstance of bilingualism.

In addition to similarities in the process of second language acquisition, the literature suggests other important commonalities between elite and folk bilinguals. There is evidence in the literature of positive correlations between bilingualism and measures of cognitive performance even among folk bilingual subjects when proper

methodological controls are employed (Duncan & De Avila, 1979; Hakuta, 1987). There appears to be nothing about the sociological situation that causes the results to be different from what has been found with elite bilinguals. Likewise, studies of “natural” translation among children not formally trained in the task show a high level of functioning both among elite bilinguals in Geneva (Malakoff, 1991) and low-SES Puerto Rican bilinguals in New Haven, Connecticut (Malakoff & Hakuta, 1991).

A final example of a bridge between elite and folk bilinguals is found in two-way bilingual education programs that involve a mix of language majority and language minority students, with the overall goal of developing bilingualism for both groups of students beginning in elementary school. These programs are rapidly growing in popularity in the United States (Christian & Mahrer, 1992). In effect, they combine the characteristics of traditional bilingual education programs for language minority students with immersion education for language majority students. They address one of the major concerns about these programs in that they address the sociolinguistic needs of language development. The concern has been that language minority students in bilingual education are not sufficiently exposed to English models (which, however, is addressed by the fact that English is ubiquitous in the United States), and the more serious problem that traditional immersion has tended to create its own sociolinguistic situation because of the lack of native speakers of the language (Selinker, Swain & Dumas, 1975). This elite-folk combinant experiment deserves to be followed with special interest because it directly addresses the major sociological tension in the field of second language acquisition.

Basic vs. Applied Research

Both first and second language acquisition are exciting fields because they hold promise to help answer important fundamental theoretical questions on the nature of language, mind and culture. Yet one striking characteristic about research in second language acquisition is the extent to which it is motivated by the need to address problems of the real world. The activity of second language acquisition researchers is far more clearly shaped by societal concerns than is the work of their first language acquisition counterparts.

For example, there is an impressive body of research on the Canadian French immersion experience in which Anglophone students are placed in French-only classes from kindergarten (e.g., Lambert & Tucker, 1972; Lambert, 1984; Genesee, 1978). The main question that is asked is whether they are able to maintain pace in English language arts and subject matter with Anglophone students schooled only in English. This is a primary question because while parents want their children to become functional in French, they also want strong reassurance that they are not losing ground in the dominant language of the country. The research has also examined the effectiveness of program variations, using different configurations of grade and language mixtures (see Genesee, 1984).

The questions that motivate second language acquisition researchers, of course, fall along the entire spectrum from basic to applied. On the more “theoretical” end, questions asked by second language acquisition researchers include: Are there any negative or positive consequences, either in terms of language or cognitive development,

associated with bilingualism (e.g., Diaz, 1983)? Is there an optimum age for second language learning/teaching (e.g., Long, 1990)? What are the differences between the cognitive and social uses of language when it comes to second language acquisition (e.g., Snow, 1987).

Somewhat more applied in nature are questions such as: What should be the expected rate of second language acquisition so that we can build policy expectations about how long children might stay in bilingual education programs (e.g., Collier, 1987)? How can bilingual children best be assessed in terms of their language proficiency and academic achievement (e.g., Cummins, 1981)?

Among the most applied of research questions concern program evaluation: What are the characteristics of effective bilingual education classes (e.g., Tikunoff, 1983)? Does immersion in French impede the academic and English language development of Canadian anglophone students (e.g., Lambert & Tucker, 1972)? What is the relative effectiveness of various approaches to the education of language minority students (e.g., Ramirez, et al, 1991).

Perhaps not surprisingly, it is the most applied, policy-oriented questions that tend to generate the greatest amount of political controversy. At times, the political heat obstructs the ability to conduct objective research, or unnecessarily constrains the way in which the questions are framed. In our view, such a situation must be balanced by good, theoretically sound, basic research. This need is most dramatically demonstrated in the case of the pursuit of a single policy point: the Lau question.

The Lau Question

The Lau question in the education of “limited-English-proficient” students in the U. S. refers to whether it is justified to prescribe transitional bilingual education (providing content instruction in the native language until the child becomes proficient in English) as a method to educate such students. The name Lau comes from the 1974 Supreme Court ruling, Lau v. Nichols, which ruled that the San Francisco school district had violated Title VI of the Civil Rights Act of 1964 by failing to provide specialized programs to meet the needs of Chinese-American students who were limited in English proficiency. In response to this ruling, the Department of Health, Education and Welfare issued a set of proposed remedies (known as the Lau remedies) to be used by the Office for Civil Rights to negotiate compliance plans with school districts that did not provide special programs for limited-English proficient students, and thus were in violation of Federal law. These proposed remedies, and a proposed federal regulation issued in 1980, required the provision of transitional bilingual education in most instances (see Baker & de Kanter, 1983a, Appendices A, B, and C).

In addition to the proposed remedies, the Bilingual Education Act (Title VII of the Elementary and Secondary Education Act) authorized competitive grants to local school districts to develop their capacity to provide bilingual education. This law required that most funds be used to provide programs that used native language instruction. Combined with the Lau remedies, these federal actions could be viewed as the affirmation and prescription of bilingual education for limited-English-proficient students (Birman & Ginsburg, 1983).

The Lau question has been controversial from the beginning, especially during the presidency of Ronald Reagan (1981-1988). The political character of the problem stemmed from the perception that this amounted to federal sanction of ethnolinguistic diversity as well as the intrusion of the federal government in local governance (Epstein, 1977). These are questions that speak to the heart of American identity. The Lau question has inevitably come to define the research in this area, especially work funded by the government.

A number of major attempts have been undertaken to examine whether bilingual education is more effective than alternatives, such as the provision of ESL (English as a Second Language) only. All studies were conducted at the elementary school level, in most cases focusing on English proficiency and academic achievement measured in English. A study by the American Institutes for Research (Danoff et al, 1977, 1978) compared a large sample of students in Title VII-funded transitional bilingual education programs with those who were not. Baker and de Kanter (1983b) summarized available individual evaluations of bilingual education projects that reported data from control groups (where bilingual education was not available). In the 1980's, the Department of Education commissioned a pair of longitudinal studies. One study attempted to follow a nationally representative sample of LEP students who varied in the types of services they received, and to conduct causal modelling of the data to determine the effectiveness of the service types (Development Associates, 1986). Another (Ramirez et al, 1991) used a more traditional comparison model to look at three existing models (transitional

bilingual education, “structured immersion” in English only, and bilingual education with a native language maintenance orientation) in a selected number of schools.

These studies (many of them rather expensive) have failed to provide conclusive evidence on the Lau question -- whether bilingual education is superior and therefore should be the method of choice. What should the conclusion be? Is the null hypothesis correct? Or have we a case of Type II error? Many have speculated. Critics of bilingual education prefer the interpretation that the evidence is accurate, and there is indeed no effect (Rossell & Ross, 1986). Supporters claim the evidence foul, pointing out the flaws (not a difficult task) in the studies (e.g, Gray, 1981), or become philosophical about whether the positivistic approach toward program evaluation is appropriate (Cziko, 1992). Other supporters look at the evidence and find solace in the fact that the more honest comparisons yield data in favor of bilingual education (Willig, 1985).

It may well be the case that these evaluation studies point to the limits of an approach that compares one program type with another. A National Academy of Sciences panel conducted a thorough review of these two major national longitudinal studies (Fienberg & Meyer, 1992). Aside from documenting fatal design flaws in the studies, the panel was critical of the general atheoretical orientation of the research program, essentially arguing that large studies cannot serve as theoretical prosthesis. Rather, the panel recommended a model of knowledge development based on smaller scale, targeted studies that test and refine the basic theoretical premises of bilingual education (as in Canada).

Many of the theoretical questions, it turns out, have been asked by second language acquisition researchers whose work lean toward the basic research end of the spectrum. For example, in answering the question of whether bilingual education is effective, much of the fear is based on the belief that second language acquisition is a zero-sum process such that instruction in the native language detracts from rapid and efficient learning of English. Yet the basic research here suggests that if anything, there is a positive correlation between first and second language proficiency, and the cognitive consequences of bilingualism are probably positive (Cummins, 1976). This finding should allay the concern that bilingual education comes at the expense of English development.

Another important finding is the rate of second language acquisition, which suggests that most children do not attain the asymptotic levels of English proficiency for anywhere between 5 to 7 years, considerably less than the time frame (usually two years) required in federal and state legislation (Collier, 1987). Setting more realistic expectations of the rate of English development is critical in ensuring that bilingual education programs not be evaluated solely on the speed with which students exit from the programs.

Perhaps the most important contribution of the perspective provided by basic research has been its ability to offer insights into the processes involved in the maintenance and loss of bilingualism. This effort is a multidisciplinary one, ranging from sociology (e.g., Fishman *et al.*, 1966; Veltman, 1983), ethnography of communication (e.g., Gal, 1979; Gumperz, 1982; Trueba, 1989), linguistics (e.g., Extra & Verhoeven, 1993),

and psychology (e.g., Hakuta, Diaz & Ferdman, 1987; Hakuta & D'Andrea, 1992).

These perspectives amply demonstrate the complexity of the factors involved in bilingualism and point to the barren nature of the ways in which the questions have been addressed in the program-oriented, applied research studies. In a nutshell, this area of basic research extends the perspective on bilingual proficiency from the psycholinguistic to the sociolinguistic, and from the individual to the speech community as the unit of concern. Under this view, what is learned is not just the ability to speak the second language and maintain the native language, but rather the ability and the social capacity to become active participants in two speech communities. In addition, maintenance of bilingual proficiency is viewed not just as the question of an individual who, in the course of the lifetime, might retain or lose proficiency in the ethnic language. Rather, the additional question is whether the ethnic language gets transmitted to the next generation of the speech community, or whether the speech community withers away.

As to the Lau question, it is likely that the policy community would have little patience for what they would see as the basic research on social science gibberish about bilingualism. From their perspective, they are interested in the bottom line, whether the programs that are funded work or do not work. They are not interested in fantasizing about what is possible -- to use Cziko's (1992) words, they are interested in what is the "probable" outcome of the programs, not in what is "possible". Basic and applied research must meet somewhere in between if they are to have any impact. The ideas generated from basic research need to be woven into the culture of policy and programs

and become an integral part of evaluation studies.

Theory vs Data

One of the enduring tensions in any field of inquiry concerns theory and methodology. This is no less the case in second-language research. There are those who argue that theory should drive research and others who feel that one should work from the bottom up, building theory piece by piece on the basis of research findings.

Where to Begin

This issue has been addressed by Long (1985), who distinguished between a “theory-then-research” strategy and a “research-then-theory” strategy. No research is entirely a-theoretical, but some research is more theory-driven than other research. Long noted that there are advantages and disadvantages to both the theory-then-research and the research-then-theory orientations.

The theory-then-research strategy has the advantage of providing an approximate answer until the “final truth” is known. Such theories serve a useful heuristic, assuming that they generate testable hypotheses that can confirm or disconfirm the theory. The disadvantage of a theory-driven approach is what social psychologists call “confirmation bias” (Greenwald, Pratkanis, Leippe, & Baumgardner, 1986): one’s preliminary hypotheses have a decided advantage in the judgment process.

The advantage of the research-then-theory approach is that one is closer to the empirical evidence at hand and makes only limited claims. The likelihood of a confirmation bias is not ruled out because all research tests implicit theory, but there is

less investment in a theoretical point of view. The disadvantage is that such an approach lacks the heuristic power of a more developed theoretical approach.

Long (1985) argued that the theory-then-research strategy allows for more efficient research. He maintained that the theory governing the research at any point in time tells the investigator what the relevant data are and what is the critical experiment to run. Such a research strategy leads to explanatory accounts of the processes at work in a given domain. In contrast, Greenwald and his associates (1986) have argued that the researcher who sets out to test a theory is likely to become ego-involved with a theoretical prediction, to select procedures that lead eventually to prediction-confirming data, and thereby produce overgeneralized conclusions.

The debate has a long history in the philosophy of science. Kuhn (1962) favored the theory-then-research strategy, and argued that ordinary scientific activity thrives on theory confirmation--solving puzzles within the existing paradigm. He pointed out, however, that theory confirmation does not succeed indefinitely. Anomalous results accumulate until only a major theoretical reorganization (scientific revolution) can accommodate them. Popper (1959), on the other hand, regarded exclusive use of confirmation-seeking methods as non-scientific. In his view empirical knowledge in a scientific domain grows only by the use of critical, falsification-seeking methods.

The difficulty is that falsification-seeking is given more lip-service than practiced. If, as many have argued, all research has an implicit theory, it is impossible to escape confirmation bias. Even researchers who stay within a limited domain and deal with

only certain issues are likely to have definite expectations about their data. Nonetheless, many agree with Popper that

. . . we start our investigation with problems. We always find ourselves in a certain problem situation; and we choose a problem which we hope we may be able to solve. The solution, always tentative, consists in a theory, a hypothesis, a conjecture (1976, p. 86).

Because we approach problems with an implicit theory, the process is an interactive one: we test our conjectures, we modify our theory, and as the theory withstands tests we are less tentative in accepting the original hypothesis.

In second-language research, many investigators are currently working with a research-then-theory strategy, looking first at what the data tell us descriptively and then moving upward toward theoretical claims. Thus there were numerous empirical studies of acquisitional sequences in second-language learning before theoretical arguments were made about “natural” developmental sequences. Similarly, the data from transfer studies has only begun to be incorporated into theory as the predictions of markedness theory are tested.

On the other hand, Universal Grammar research can be described as theory-then-research. Many current second-language researchers (perhaps the majority) accept the Chomskyan framework of principles and parameters and test the predictions of the theory with second-language learners. As Schachter (1993) has pointed out, however, current Universal Grammar theoretical speculations are quite limiting when applied to second-language research. We do not even know whether the knowledge of Universal

Grammar necessary to reset the parameters is available for adult second-language acquisition. It may turn out that mature second-language learners exhibit only those characteristics of Universal Grammar instantiated in their first language and are not able to access the innate knowledge of Universal Grammar they once possessed.

Theory and Truth

In recent years there has been considerable discussion in the field of second-language research concerning the role of theory. This is reflected in the debate over the question of whether to proceed from theory to data or from data to theory. It is also reflected in the concern that the methods used in second-language research limit the question that can be answered.

One of the issues in this discussion concerns the Kuhnian notion of a “paradigm.” As has been pointed out repeatedly (e.g., Phillips, 1987), the Kuhnian notion of a “paradigm” has many different meanings. Kuhn himself was said to have used the term in 21 different meanings (Masterman, 1970) in his classic book, The structure of scientific revolutions (1962). Nonetheless, it is clear that Kuhn was talking of a paradigm as a framework that determines the key concepts and methods, the problems that are significant, and the criteria for assessing the validity of scientific findings. The choice of a paradigm cannot be made on rational grounds because “[such a choice] is not and cannot be determined merely by the evaluative procedures characteristic of normal science, for these depend in part upon a particular paradigm, and that paradigm is at issue” (1962, p.93). Once a scientist is working within a paradigm, rules of argument and evidence put forward by those working in another paradigm are bound to be suspect.

But does this not lead to the position that the arguments advanced by a scientist from one framework are no better or truer than those put forward by someone working within another paradigm? Is not a particular argument or a particular knowledge claim relative to a given framework or paradigm? This is a view that has been advanced in the second-language field by Schumann (1983), who argued that all theories are social constructions based on metaphorical systems and that it is fruitful at this stage of our knowledge to approach second-language learning from as many perspectives as possible. The dominant theories in the field, Universal Grammar, cognitive theory, and sociolinguistic theory--all have something to offer in increasing our knowledge. Schumann argued that it is possible to choose between theories on an aesthetic basis, because each theoretical position is simply an alternate construction of reality. For Schumann, no approach is unimportant, every one has something to offer.

This is the issue of incommensurability. As Phillips (1987) notes, the Kuhnian notion of paradigms leads to the conclusion that rival paradigms are incommensurable and that scientists from different paradigms are not able to engage in rational dialogue across the boundary. If Kuhn is correct and scientists working in different paradigms live and work "in different worlds," then there is no way to make interparadigmatic judgments and rational discourse is impossible across paradigms.

Certainly, truth can never be known directly and in its totality. All knowledge is mediated by the symbol systems used by scientists and by the constraints of time and culture. The symbol system or metaphor used by a particular scientific approach may help us see more clearly, but it does not constitute ultimate truth. Nor does the

combination of all partial representations of truth add up to truth in its entirety. Ultimate truth is only approximated by the shadows cast by the metaphors of our theories.

How, then, is one to avoid theoretical solipsism? The answer that most second-language researchers give is to invoke the notion of falsifiability. Theories that are self-contained cannot be tested. The theory may survive, though at best it will survive as an impervious fortress, perhaps invincible but in splendid isolation. The theory needs to be tested, though the results of research “probe” but do not “prove” a theory. A theory may repeatedly survive such probing--but may be always be displaced by a new probe. In practice, this means that a theory is either disconfirmed or escapes being disconfirmed. But it is never confirmed. This is the logic of statistical inference as well: The “null hypothesis” is never accepted--it can only be rejected or fail to be rejected.

This is not to say that Popper’s criterion of falsifiability leads to *ex cathedra* statements and infallibility. Negative evidence may not in fact undermine a theoretical position because such findings can be absorbed without invalidating the whole theory. Indeed, some theories have survived continual “refutation” (Feyerabend, 1978). While pointing out the limitations of programs of research based on the criterion of falsifiability, second-language researchers nonetheless acknowledge that this criterion is critical to theoretical development (Beretta, 1993; McLaughlin, 1993). Thus, for example, the argument that it is possible to learn second languages subliminally, say as one is falling asleep, is an hypothesis that can be empirically tested, falsified, and put to rest as a viable theory of second-language learning.

It may turn out to be the case that a theory of second-language learning needs revision as negative results are found. It may be that the theory holds in some conditions (say, with some languages and not with others). Such complexities do not invalidate the enterprise. Research is not carried out in a theoretical vacuum. Theory dictates where the researcher looks; not everything is meaningful and worth exploring.

Conclusion

We have sketched our view of nearly an entire century's worth of research on bilingualism and second language acquisition, using the dual lenses of historical phases and defining tensions. Besides providing a useful narrative structure that served as a good opportunity in which to embed empirical nuggets, has this exercise produced anything that might be of lasting value for the future researcher?

From our vantage point, here is what we think are going to be the sturdy markers for what lies ahead:

- The field will continue to be driven primarily by needs generated by practice and policy rather than by theory. Demographics of international migration that were prominent during the Psychometrics Phase and the Language Minority Phase will continue to be the main force underlying interest for folk bilingualism, and will probably continue to dominate the attention over the issues of elite bilingualism. However, the issue of global economic competitiveness, current as of the writing of this review, is also likely to gain prominence in defining the policy direction of foreign language education.

- Especially in the realm of language policy, key theoretical chestnuts, such as empiricism vs. rationalism and the psycholinguistic vs. sociolinguistic distinctions, will become increasingly salient concepts once they awaken from the myopic focus on English acquisition. Researchers will have to play a role as catalyst in this process, by pointing out the relevance of these theories to policy and practice, and by making their findings accessible to individuals outside of the research community.
- The most influential research will be that which successfully incorporates these theoretical chestnuts and provide guidance on the correctness or incorrectness of the positions as they become applied to practice, professional development, and policy.
- It is unlikely that researchers who work in the basic disciplines will become terribly excited about attending to the problems of bilingualism and second language acquisition despite the fact that they are filled with opportunities for testing their theories. This prospect might be a source of frustration for some second language researchers because it means that they will always bear the mark of being “derivative” researchers, asking questions that other people decide are either au courant or passé in the disciplines. The comforting news, as our review has shown, is that the really good research questions have a tendency to come back around, and that we are all part of the same enterprise of asking age-old questions in ways that are increasingly sophisticated, and even socially useful.

FOOTNOTES

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References

- Anderson, J. R. (1983). The architecture of cognition. Cambridge, MA: Harvard University Press.
- Baker, K. & de Kanter, A. (Eds.) (1983a). Bilingual education: A reappraisal of federal policy. Lexington, MA: Lexington Books.
- Baker, K. & de Kanter, A. (1983b). Federal policy and the effectiveness of bilingual education. In K. Baker and A. de Kanter (Eds.), Bilingual education: A reappraisal of federal policy (pp. 33-86). Lexington, MA: Lexington Books.
- Bates, E. and MacWhinney, B. (1982). Functional approaches to grammar. In E. Wanner and L. Gleitman (Eds.), Language Acquisition: The state of the art. New York: Cambridge University Press.
- Beretta, A. (1993). Cognitive and social determinants of discovery in second language acquisition. Applied Linguistics, 14, 250-275.
- Bernstein, B. (1961). Social class and linguistic development: a theory of social learning. In A. H. Halsey, J. Floud & C. Anderson (Eds.), Education, economy and society (pp. 288-314). Glencoe, IL: Free Press.
- Bialystok, E. (1981). Some evidence for the integrity and interaction of two knowledge sources. In R. Anderson (Ed.), New dimensions in second language acquisition research. Rowley, MA: Newbury House.
- Bialystok, E. (1988). Levels of bilingualism and levels of linguistic awareness. Developmental Psychology, 24, 560-567.

- Birman, B. & Ginsburg, A. (1983). Introduction: Addressing the needs of language-minority children. In K. Baker and A. de Kanter (Eds.), Bilingual education: A reappraisal of federal policy (pp. ix-xxi). Lexington, MA: Lexington Books.
- Bley-Vroman, R. (1990). The logical problem of foreign language learning. Linguistic Analysis, 20, 3-49.
- Bley-Vroman, R., Felix, S., and Ioup, G. (1988). The accessibility of universal grammar in adult language learning. Second Language Research, 4, 1-32.
- Brent-Palmer, C. (1979). A sociolinguistic assessment of the notion 'immigrant semilingualism' from a social conflict perspective. Working Papers on Bilingualism, 9, 1-43.
- Brown, R. (1973) A first language: The early stages. Cambridge, MA: Harvard University Press.
- Carr, T. (1981). Building theories of reading ability: On the relation between individual differences in cognitive skills and reading. Cognition, 9, 73-114.
- Chomsky, N. (1957). Syntactic structures. The Hague: Mouton.
- Chomsky, N. (1965). Aspects of the theory of syntax. Cambridge, MA: MIT Press.
- Chomsky, N. (1980). Rules and Explanations. New York: Columbia University Press.
- Chomsky, N., (1984). Changing perspectives on knowledge and use of language. Unpublished manuscript. MIT. Cited in Flynn (1985).
- Christian, D. & Mahrer, C. (1992). Two-way bilingual programs in the United States: 1991-1992. Washington, DC: National Center for Research in Cultural Diversity and Second Language Learning, Center for Applied Linguistics.

- Collier, V. (1987). Age and rate of acquisition of second language for academic purposes. TESOL Quarterly, 21, 617-641.
- Corder, S. P. (1967). The significance of learners' errors. International Review of Applied Linguistics, 5, 161-170.
- Cummins, J. (1976). The influence of bilingualism on cognitive growth: A synthesis of research findings and explanatory hypothesis. Working Papers on Bilingualism, 9, 1-43.
- Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In Schooling and language minority students: A theoretical framework (pp. 3-49). California State Department of Education.
- Cummins, J. & Swain, M. (1983). Analysis-by-rhetoric: Reading the text or the reader's own projections? A reply to Edelsky et al. Applied Linguistics, 4, 23-41.
- Cziko, G. (1992). The evaluation of bilingual education: From necessity and probability to possibility. Educational Researcher, 21 (2), 10-15.
- Danoff, M., Coles, G., McLaughlin, D. & Reynolds, D. (1977, 1978). Evaluation of the impact of ESEA Title VII Spanish/English bilingual education programs. 3 vols. Palo Alto, CA: American Institutes for Research.
- Delpit, L. (1986). Skills and other dilemmas of a progressive black educator. Harvard Educational Review, 56, 379-385.
- Development Associates (1986). Year 1 report of the longitudinal phase. Technical report, Development Associates Inc., Arlington, VA.

- Diaz, R. M. (1983). Thought and two languages: The impact of bilingualism on cognitive development. Review of Research in Education, 10, 23-54.
- Diaz, R. M. (1985). Bilingual cognitive development: Addressing three gaps in current research. Child Development, 56, 1376-1388.
- Dickerson, L. (1975). Interlanguage as a system of variable rules. TESOL Quarterly, 9, 401-407.
- Dulany, D. E., Carlson, R. A., & Dewey, G. I. (1984). A case of syntactical learning and judgment: How conscious and how abstract? Journal of Experimental Psychology: General, 113, 541-555.
- Duncan, S. & De Avila, E. (1979). Bilingualism and cognition: Some recent findings. NABE Journal, 4, 15-50.
- Edelsky, C. (1990). Whose agenda is this anyway? A response to McKenna, Robinson, and Miller. Educational Researcher, 19, 7-11.
- Edelsky, C., Altwerger, F., Barkin, B., Flores, S., Hudelson, S. & Jilbert, K. (1983). Seimilingualism and language deficit. Applied Linguistics, 4, 1-22.
- Eimas, P., Siqueland, E., Jusczyk, P. & Vigorito, J. (1971). Speech perception in infants. Science, 171, 303-306.
- Ellis, R. (1985). Understanding second language acquisition. Oxford: Oxford University Press.
- Epstein, N. (1977). Language, ethnicity, and the schools: Policy alternatives for bilingual-bicultural education. Washington, D.C.: Institute for Educational Leadership, George Washington University.

- Extra, G. & Verhoeven, L. (Eds.) (1993). Immigrant languages in Europe. Clevedon, England: Multilingual Matters.
- Faerch, C. and Kasper, G. (Eds.) (1983). Strategies in interlanguage communication. London: Longman.
- Felix, S. (1984). Two problems of language acquisition: The relevance of grammatical studies in the theory of interlanguage. In A. Davies & C. Cramer (Eds.), Interlanguage: Proceedings of the Seminar in Honor of Pit Corder. Edinburgh: Edinburgh University Press.
- Feyerabend, P. (1978). Against method. London: Verso.
- Fienberg, S. & Meyer, M. (Eds.) (1992). Assessing education studies: The case of bilingual education strategies. Washington, DC: National Academy Press.
- Fishman, J. (1977). The social science perspective. In Bilingual education: Current perspectives: Social science (pp. 1-49). Arlington, VA: Center for Applied Linguistics.
- Fishman, J. & Gertner, M. (1985). The rise and fall of the ethnic revival: Perspectives on language and ethnicity. Berlin: Mouton.
- Fishman, J., Nahirny, V., Hofman, J. & Hayden, R. (1966). Language loyalty in the United States. The Hague: Mouton and Company.
- Flynn, S. (1984). A universal in L2 acquisition based on a PBD typology. In F. Eckman (Ed.) Universals in second language acquisition. Rowley, Mass.: Newbury House.
- Flynn, S. (1985). Principled theories of L2 acquisition. Studies in Second Language Acquisition, 7, 99-107.

- Gagne, E. (1985). The cognitive psychology of school learning. Boston: Little, Brown and Company.
- Fodor, J. A. (1983). Modularity of mind. Cambridge, MA: MIT Press.
- Gal, S. (1979). Language shift: Social determinants of linguistic change in bilingual Austria. New York: Academic Press.
- Garcia, G. E. & Pearson, P. D. (1990). Modifying reading instruction to maximize its effectiveness for “disadvantaged” students. In Better schooling for the children of poverty: Alternatives to conventional wisdom. Washington, D.C.: U.S. Department of Education, Office of Planning, Budget and Evaluation.
- Gass, S. M. (1987). The resolution of conflicts among competing systems: A bidirectional perspective. Applied Psycholinguistics, 8, 329-350.
- Genesee, F. (1984). Historical and theoretical foundations of immersion education. In Studies on immersion education (pp. 32-57). Sacramento, CA: California State Department of Education.
- Gibson, E. (1992). The crosslinguistic study of sentence processing-- by MacWhinney and Bates. Language, 68, 812-830.
- Gibson, E., & Levin, H. (1975). The psychology of reading. Cambridge, MA: MIT Press.
- Greenwald, A. G., Pratkanis, A. R., Leippe, M. R., & Baumgardner, M. H. (1986). Under what conditions does theory obstruct research progress? Psychological Review, 9, 216-229.

- Goodenough, F. (1926). Racial differences in the intelligence of school children. Journal of Experimental Psychology, 9, 388-397.
- Gray, T. (1981). Challenge to USOE Final Evaluation of the Impact of ESEA Title VII Spanish/English Bilingual Education Programs. Artlington, VA: Center for Applied Linguistics.
- Gregg, K. R. (1990). The Variable Competence Model of second language and why it isn't. Applied Linguistics, 11, 364-383.
- Gumperz, J. (1982). Discourse strategies. New York: Cambridge University Press.
- Gutierrez, K. (1992). A comparison of instructional contexts in writing process classrooms with Latino children. Education and Urban Society, 24, 244-262.
- Hakuta, K. (1983). English language acquisition by speakers of Asian languages. In M. Chu-Chang (Ed.), Asian- and Pacific-American perspectives in bilingual education (pp. 31-55). New York: Teachers College Press.
- Hakuta, K. (1986). Mirror of language: The debate on bilingualism. New York: Basic Books.
- Hakuta, K. (1987). Degree of bilingualism and cognitive ability in mainland Puerto Rican children. Child Development, 58, 1372-1388.
- Hakuta, K. & D'Andrea (1992). Some properties of bilingual maintenance and loss in Mexican background high-school students. Applied Linguistics, 13, 72-99.
- Hakuta, K. & Cancino, H. (1977). Trends in second-language acquisition research. Harvard Educational Review, 47, 294-316.

- Hakuta, K., Diaz, R. & Ferdman, B. (1987). Bilingualism and cognitive development: Three perspectives. In S. Rosenberg (Ed.), Advances in Applied Psycholinguistics Volume II: Reading, Writing and Language Learning. (pp. 284-319). Cambridge: Cambridge University Press.
- Harrington, M. (1987). Processing transfer: Language-specific processing strategies as a source of interlanguage variation. Applied Psycholinguistics, 8, 351-378.
- Harris, K. R. & Graham, S. (1992). Self-regulated strategy development: A part of the writing process. In M. Pressley, K. W. Harris, & J. T. Guthrie (Eds.), Promoting academic competence and literacy in schools. New York: Academic Press.
- Hatch, E. (1983). Psycholinguistics: A second language perspective. Rowley, MA: Newbury House.
- Hubel, D. (1988). Eye, brain, and vision. New York: Scientific American Library.
- Imhoff, G. (1990). The position of U.S. English on bilingual education. Annals of the American Academy of Political Science, 508, 48-61.
- Jensen, A. R. (1980). Bias in mental testing. New York: Free Press.
- Johnson, J. & Newport, E. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. Cognitive Psychology, 21, 60-99.
- Kaplan, A. (1964). The conduct of inquiry: Methodology for the behavioral sciences. San Francisco: Chandler.
- Kennedy, B. L. (1988). Adult versus child L2 acquisition: An information-processing approach. Language Learning, 38, 477-495.

- Krashen, S. (1982). Principles and practices of second language acquisition. Oxford: Pergamon Press.
- Kuhl, P., Williams, K., Lacerda, F., Stevens, K. & Lindblom, B. (1992). Linguistic experience alters phonetic perception in infants by 6 months of age. Science, 255, 606-608.
- Kuhn, T.S. (1962), The structure of scientific revolutions. Chicago: University of Chicago Press.
- LaBerge, D., & Samuels, S. J. (1974). Towards a theory of automatic information processing in reading. Cognitive Psychology, 6, 293-323.
- Labov, W. (1970). The study of language in its social context. Studium Generale, 23, 30-87.
- Labov, W. (1972). Language in the inner city. Philadelphia: University of Pennsylvania Press.
- Lado, R. (1964). Language teaching: A scientific approach. New York: McGraw Hill.
- Lambert, W. E. (1975). Culture and language as factors in learning and education. In A. Wolfgang (Ed.), Education of immigrant students (pp. 55-83). Toronto: Ontario Institute for Studies in Education.
- Lambert, W. E. (1984). An overview of issues in immersion education. In Studies on immersion education (pp. 8-30). Sacramento, CA: California State Department of Education.
- Lambert, W. E. & Tucker, G. R. (1972). Bilingual education of children: The St. Lambert experiment. Rowley, MA: Newbury House Publishers.

- Larsen-Freeman, D. (1976). An explanation for the morpheme acquisition order of second language learners. Language Learning, 26, 125-134.
- Lenneberg, E. H. (1967). Biological foundations of language. New York: Wiley.
- Long, M. (1985). Theory construction in second language acquisition. Paper presented at Second Language Research Forum, University of California, Los Angeles.
- Long, M. (1990). Maturation constraints on language development. Studies in Second Language Acquisition, 12, 251-285.
- Lorenz, K. (1958). The evolution of behavior. Scientific American, 119 (6, December), 67-78.
- Macnamara, J. (1976). Comparison between first and second language learning. Die Neueren Sprachen, 2, 175-188.
- MacWhinney, B. & Bates, E. (Eds.) (1989). The crosslinguistic study of sentence processing. Cambridge: Cambridge University Press.
- MacWhinney, B., Bates, E., and Kliegl, R. (1984). Cue validity and sentence interpretation in English, German and Italian. Journal of Verbal Learning and Verbal Behavior, 23, 127-150.
- Malakoff, M. E. (1991). Natural translation ability in French-English bilingual school-age children: A case study of source language errors in naive child-translators. Ph.D. dissertation, Department of Psychology, Yale University.
- Malakoff, M. E. & Hakuta, K. (1991). Translation skill and metalinguistic awareness in bilinguals. In E. Bialystok (Ed.), Language processing and language awareness in bilingual children (pp. 141-166). Oxford: Oxford University Press.

- Marcus, G., Brinkmann, U., Clahsen, H., Wiese, R., Woest, A. & Pinker, S. (1993).
German inflection: The exception that proves the rule. Occasional Paper 47,
Center for Cognitive Science, MIT.
- Masterman, M. (1970). The nature of a paradigm. In I. Lakatos & A. Musgrave (Eds.),
Criticism and the growth of knowledge. Cambridge, Cambridge University Press.
- McGroarty, M. (1989). The "good learner" of English in two settings. Technical Report
12. Center for Language Education and Research, University of California, Los
Angeles.
- McKenna, M. C., Robinson, R. D., & Miller, J. W. (1990). Whole language: A
research agenda for the nineties. Educational Researcher, 19, 3-6.
- McLaughlin, B. (1980). On the use of miniature artificial languages in second-language
research. Applied Psycholinguistics, 1, 353-365.
- McLaughlin, B. (1986). Theories of second-language learning. London: Arnold.
- McLaughlin, B. (1990). Restructuring. Applied Linguistics, 11, 1-16.
- McLaughlin, B. (1993). Paradigms lost: The evolution of knowledge in the search for
truth. A presentation to be given at the working meeting: "Second Language
Acquisition Theory Construction," Washington, D. C.
- McLaughlin, B. & Harrington, M. (1989). Second-language acquisition. Annual
Review of Applied Linguistics, 10, 122-134.
- McLaughlin, B., Rossman, T., & McLeod, B. (1983). Second-language learning: An
information-processing perspective. Language Learning, 33, 135-158.

- Means, B. & Knapp, M. S. (1991). Models for teaching advanced skills to educationally disadvantaged children. In Teaching advanced skills to educationally disadvantaged children. Washington, D.C.: U.S. Department of Education, Office of Planning, Budget, and Evaluation.
- Moerk, E. (1983). The mother of Eve -- as a first language teacher. Norwood, NJ: Ablex.
- Moeser, S. D. (1977). Semantics and miniature artificial languages. In J. Macnamara (Ed.), Language learning and thought. New York: Academic Press.
- Morgan J. L. & Newport, E. L. (1981). The role of constituent structure in the induction of an artificial language. Journal of Verbal Learning and Verbal Behavior, 20, 67-85.
- Nation, R. and McLaughlin, B. (1986). Experts and novices: An information-processing approach to the "good language learner" problem. Applied Psycholinguistics, 7, 41-56.
- Nayak, N. Hansen, N., Krueger, N. & McLaughlin, B. (1990). Language-learning strategies in monolingual and multilingual subjects. Language Learning, 40, 221-244.
- Newport, E. (1991). Contrasting conceptions of the critical period for language. In S. Carey & R. Gelman (Eds.), The epigenesis of mind: Essays in biology and cognition (pp. 111-130). Hillsdale, NJ, Earlbaum.
- OECD (1989). One school, many cultures. Paris: Centre for Educational Research and Innovation, Organisation for Economic Co-operation and Development.

- O'Malley, J. M. and Chamot, A. U. (1989). Learning strategies in second language acquisition. New York: Cambridge University Press.
- Ong, W. (1982). Orality and literacy: The technologizing of the word. London: Methuen.
- Oxford, R. L. (1986). Second language learning strategies: Current research and implications for practice. Technical Report 3. Center for Language Education and Research, University of California, Los Angeles.
- Oyama, S. (1976). A sensitive period for the acquisition of a nonnative phonological system. Journal of Psycholinguistic Research, 5, 261-285.
- Padilla, A. (1990). Bilingual education: Issues and perspectives. In A. Padilla, H. Fairchild & C. Valadez (Eds.), Bilingual education: Issues and strategies (pp. 15-26). Newbury Park, CA: SAGE Publications.
- Patkowski, M. (1980). The sensitive period for the acquisition of syntax in a second language. Language Learning, 30, 449-472.
- Paulston, C. (1982). Swedish research and debate about bilingualism: A report to the National Swedish Board of Education. Stockholm: National Swedish Board of Education.
- Pearson, P. D., & Raphael, T. E. (1991). Reading comprehension as a dimension of thinking. In B. F. Jones & L. Idol (Eds.), Dimensions of thinking and cognitive instruction: Implications for educational change. Hillsdale, NJ: Erlbaum.
- Penfield, W. & Roberts, L. (1959). Speech and brain mechanisms. Princeton, NJ: Princeton University Press.

- Perfetti, C. A., & Hogaboam, T. W. (1975). The relationship between single word decoding and reading comprehension skill. Journal of Educational Psychology, 67, 461-469.
- Phillips, D. C. (1987). Philosophy, science, and social inquiry. New York: Pergamon Press.
- Popper, K. (1959). The logic of scientific discovery. New York: Basic Books.
- Popper, K. (1976). Unended quest. Illinois: Open Court.
- Preston, D. (1993). Variation linguistics and SLA. Second Language Research, 9, 153-172.
- Ramirez, D. J., Yuen, S. D., Ramey, D. R. & Pasta, D. J. (1991). Longitudinal study of structured-English immersion strategy, early-exit and late-exit transitional bilingual education programs for language-minority children (2 Vols.). San Mateo, CA: Aguirre International.
- Ramsey, R. M. G. (1980). Language-learning approach styles of adult multilinguals and successful language learners. Annals of the New York Academy of Sciences, 345, 73-96.
- Reber, A. (1976). Implicit learning of synthetic languages; The role of instructional set. Journal of Experimental Psychology: Human Learning and Memory, 2, 88-94.
- Reber, A. S., & Allen, R. (1978). Analogic and abstraction strategies in syntactic grammar learning: A functionalist interpretation. Cognition, 6, 189-221.

- Ritchie, W. (1978). The right-roof constraint in an adult acquired language. In Ritchie, W. (Ed.), Second language acquisition research: Issues and implications. New York: Academic Press.
- Rivers, W. (1964). The psychologist and the foreign language teacher. Chicago: University of Chicago Press.
- Romaine, S. (1989). Bilingualism. Oxford: Basil Blackwell.
- Rossell, C. & Ross, J. M. (1986). The social science evidence on bilingual education. Journal of Law and Education, 15, 385-419.
- Schachter, J. (1993). Second language acquisition: Perceptions and possibilities. Second Language Research, 8, 173-187.
- Schmidt, R. (1977). Sociolinguistic variation and language transfer in phonology. Working Papers on Bilingualism, 12, 79-95.
- Schmidt, R. (1990). The role of consciousness in second language learning. Applied Linguistics, 11, 129-158.
- Schumann, J. (1983). Art and science in second language acquisition research. Language Learning, 33, 49-75.
- Selinker, L., Swain, M. & Dumas, G. (1975). The interlanguage hypothesis extended to children. Language Learning, 25, 139-152.
- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. Psychological Review, 84, 27-190.

- Skutnabb-Kangas, T. & Toukomaa, P. (1976). Teaching migrant children's mother tongue and learning the language of the host country in the context of the socio-cultural situation of the migrant family. Helsinki: Finnish National Commission for UNESCO.
- Smith, M. (1931). Some light on the problem of bilingualism as found from a study of the progress in mastery of English among pre-school children of non-American ancestry in Hawaii. Genetic Psychology Monographs, 21, 119--284.
- Snow, C. E. (1987). Beyond conversation: Second language learners' acquisition of description and explanation. In J. P. Lantolf & A. Labarca (Eds.), Research in second language learning: Focus on the classroom (pp. 3-16). Norwood, NJ: Ablex.
- Tarone, E. (1983). On the variability of interlanguage systems. Applied Linguistics, 4, 143-163.
- Thompson, G. G. (1952). Child psychology. Boston: Houghton Mifflin.
- Trueba, H. (1989). Raising silent voices. New York: Newbury House Publishers.
- Tikunoff, W. J. (1983). Significant Bilingual Instructional Features Study. San Francisco: Far West Laboratory.
- Valdes, G. (1992). Bilingual minorities and language issues in writing. Written Communication, 9, 85-136.
- Vellutino, F. R., & Scanlon, D. M. (1982). Verbal processing in poor and normal readers. In C. J. Brainerd & M. Pressley (Eds.), Verbal processes in children: Progress in cognitive development research. New York: Springer-Verlag.

- Veltman, C. (1983). Language shift in the United States. Berlin, New York, and Amsterdam: Mouton.
- Wenden, A. L. (1987). Metacognition: An expanded view on the cognitive abilities of L2 learners. Language Learning, 37, 573-598.
- White, L. (1985). The acquisition of parameterized grammars: Subjacency in second language acquisition. Second Language Research, 1, 1-17.
- White, L., (1989). Universal grammar and second language acquisition. Amsterdam: John Benjamins.
- White, L. & Genesee, F. (1992). How native is a near-native speaker? Paper presented at the Boston University Conference on Language Development, October, 1992.
- Williams, L. (1974). Speech perception and production as a function of exposure to a second language. Ph.D. dissertation, Department of Psychology and Social Relations, Harvard University.
- Willig, A. (1985). A meta-analysis of selected studies on the effectiveness of bilingual education. Review of Educational Research, 55, 269-317.
- Zentella, A. C. (1981). Language variety among Puerto Ricans. In C. A. Ferguson & S. B. Heath (Eds.), Language in the USA (pp. 218-238). New York: Cambridge University Press.