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In This Issue

Although it is probably fruitless to attempt to rank issues in TESOL in order of importance, there can be no question that the topics dealt with by the contributors to this issue of the Quarterly have figured very prominently in recent debate and discussion about English for speakers of other languages. English for language minority students in public schools, the development of effective training materials and procedures for nonnative English-speaking teaching assistants in higher education, the development of writing ability in a second language, and the role of interaction in second language development are the principal topics that readers will encounter in the article-length contributions to this issue. Together, the articles attest to the diversity of research approaches that are being applied to the investigation of English language teaching and to the continuing commitment of our field to systematic exploration of the ends and means of language instruction.

Virginia Collier reports a cross-sectional study of the length of time required for limited English proficient students receiving instruction in English in all subject areas to become proficient in English for academic purposes. The subjects, who were enrolled in the same school district, represented a wide variety of first language backgrounds; all, however, came from families of roughly similar socioeconomic status (both in the home country and in the United States) and with strong middle-class aspirations. In addition, all subjects had little or no proficiency in English upon arrival in the U.S. and were at or close to grade level in mathematical and literacy skills in their first language. The results of the study confirm findings of previous research and lead Collier to suggest that “5-, 6-, and 7-year-old arrivals might acquire English for academic purposes more rapidly if they were provided a minimum of 2 years of continuing cognitive academic language development in the L1.” If school districts choose not to offer instruction in students’ first language, either on principle or for reasons of practicality, school personnel must keep in mind that the development of proficiency in English for academic purposes takes a long time: for limited English proficient students in general, from 4-8 years to achieve average performance on standardized tests in reading, language arts, mathematics, science, and social studies.
Patricia Rounds argues that a characterization of communicatively effective classroom discourse is needed for training programs for nonnative English-speaking teaching assistants (NNS TAs) with less than adequate proficiency in English. General-purpose materials are, according to Rounds, "neither sufficient nor efficient" in helping NNS TAs to understand the nature of the classroom and the language demands made by classroom instruction. Rounds's article offers a number of suggestions for specific-purpose instruction for NNS TAs based on a quantitative and qualitative analysis of the discourse of 5 university-level mathematics classes taught by native English-speaking and NNS TAs. The analysis focuses on the use of pronouns, the role of silence in the classroom, the verbalization of symbolic representation, and the use of elaboration. Among the specific linguistic devices that appear to characterize successful use of elaboration in mathematics and (perhaps) other classrooms, Rounds discusses the naming of processes, the explicit marking of junctures, the use of cohesion and continuity through repetition and "linking talk," the overt marking of the organization of topics and topic changes, explicit statements of student responsibilities, the timely use of questions, and the use of persuasion.

The analysis of research and instructional approaches in writing was the topic of the Academic Session organized by the TESOL Research Interest Section for the 20th Annual TESOL Convention, held in Anaheim in March 1986. The Quarterly offers revised versions of the papers presented at that session.

Craig Chaudron's introduction begins with an explanation of the selection of writing as the topic for the session. According to Chaudron, the rapid accumulation of the literature on writing in a second language has created the need for "a synthesis of findings on writing processes to guide teachers and researchers in their work with L2 writers." Chaudron points out, however, that neither of the two articles advocates uncritical acceptance and implementation of a process approach to writing. Rather, the articles stress the importance of such practices as helping to expand learners' knowledge about discourse forms and creating the optimal environment for students to learn how to discover and create meaning.

Ulla Connor argues that recent developments in text-analysis methodology can help achieve an integrated theory of writing in a second language. Connor reviews recent research in text linguistics, distinguishing between sentence-based and process-centered approaches. The principal concern of the former is what links sentences together into paragraphs and paragraphs together into texts, whereas the latter approach is concerned with the production and comprehension of whole texts. Connor discusses several analytical procedures that appear to hold promise for instructional applications, including topical structure analysis and the teaching of top-level rhetorical structures.
The article concludes by indicating that the development of an integrated theory of writing has been and will continue to be a highly interdisciplinary undertaking, involving contributions from rhetoricians, linguists, psychologists, and teachers.

Vivian Zamel reviews recent investigations of the writing process, which she asserts “can tell us not only about the way our students write, but also about the extent to which what we do as teachers affects their writing.” Zamel notes, however, that to date, recent examinations of the teaching of writing suggest that process research is “neither informing nor transforming pedagogy.” Other studies carried out in classroom settings underscore the importance of taking into account “all the contextual factors, ones that go even beyond the classroom, that can affect not only the development of writing, but schooling altogether.” Together with research that identifies effective alternatives to traditional, teacher-centered models of writing instruction, research on the cognitive, affective, and contextual factors that affect writing points to a pedagogy that views writing as a “meaning-making event.” For such a pedagogy to be successful, teachers must create “a supportive environment in which students are acknowledged as writers, encouraged to take risks, and engaged in creating meaning.”

• How can schools intervene to enhance language acquisition for second language learners? Diane August reports a study of peer tutoring that offered children acquiring a second language opportunities for successful initiation and meaningful interaction with native speakers. August’s study involved two experiments, in both of which a peer-tutoring treatment “provided a structured setting for natural language practice between the tutor, who was a limited English-speaking or limited Spanish-speaking child acquiring a second language, and the tutee, a child fluent in the target language.” These two quasi-longitudinal studies, which employed a matched-pairs experimental design, were carried out over a period of 6 months. August found that limited English-speaking students who had served as tutors for fluent English-speaking peers produced a significantly higher frequency of English utterances in a structured setting; the difference in performance did not carry over into unstructured play activities, however. No positive treatment effects were found for the limited Spanish-speaking subjects who served as peer tutors in the second experiment. From these findings, August suggests that peer tutoring may be a promising ESL technique but that its value in enhancing development in a second language with lower status in a particular setting may be limited.

• Teresa Pica, Richard Young, and Catherine Doughty report a study that examined the effects on comprehension of two kinds of modified input: premodified input, in the form of a linguistically simplified and more redundant version of a short lecture, and interactionally modified
input, in the form of a linguistically unmodified lecture about which listeners could seek clarification in one-to-one interaction with the speaker. Results indicated that for premodified input, redundancy was a more important factor in facilitating comprehension than was grammatical simplification. In addition, interfactional modifications of input—especially in the form of requests for clarification and comprehension checks—led to significantly greater comprehension than did premodification of the text. The authors assert that their findings have clear pedagogical implications: “Teacher talk is not, of itself, enough to ensure comprehension; rather, teachers should check on how well their students have understood and encourage them to initiate requests for clarification or to check with the teacher that they have understood correctly.”

Also in this issue:


- Brief Reports and Summaries: George Yule, Paul Hoffman, and Jack Damico report a study of the relationship between the development of self-monitoring skills and phoneme discrimination.

- The Forum: Diane Larsen-Freeman’s reaction to Leo van Lier’s review of her Techniques and Principles in Language Teaching is followed by a response by van Lier. In addition, “Let’s Put the Artificial Back Into Artificial Intelligence,” a commentary by D. Wells Coleman on a recent contribution by John Higgins to The Forum, is accompanied by a response by Higgins.

Stephen J. Gaies
Age and Rate of Acquisition of Second Language for Academic Purposes

VIRGINIA P. COLLIER
George Mason University

The study reported in this article analyzed the length of time required for 1,548 advantaged limited English proficient (LEP) students to become proficient in English for academic purposes while receiving instruction in English in all subject areas. Variables included were age on arrival, English proficiency level upon arrival, basic literacy and math skills in the native language upon arrival, and number of years of schooling in English. Second language and content-area achievement were measured by students’ performance on the Science Research Associates tests in reading, language arts, mathematics, science, and social studies. The results indicated that LEP students who entered the ESL program at ages 8-11 were the fastest achievers, requiring 2-5 years to reach the 50th percentile on national norms in all the subject areas tested. LEP students who entered the program at ages 5-7 were 1-3 years behind the performance level of their LEP peers who entered the program at ages 8-11, when both groups had the same length of residence. Arrivals at ages 12-15 experienced the greatest difficulty and were projected to require as much as 6-8 years to reach grade-level norms in academic achievement when schooled all in the second language. Whereas some groups may reach proficiency in some subjects in as little as 2 years, it is projected that at least 4-8 years may be required for all ages of LEP students to reach national grade-level norms of native speakers in all subject areas of language and academic achievement, as measured on standardized tests.

Acquiring a second language is never easy. Some people would like to think it is fairly simple for young children, but second language acquisition (SLA) researchers have documented a very complex process that occurs over a long period of time (McLaughlin, 1984). First language acquisition begins at birth and
continues through at least age 12, with continuing acquisition of new vocabulary and subtleties of the language throughout our adult lives (de Villiers & de Villiers, 1979).

Second language is acquired to varying degrees of proficiency depending on the context in which the acquirer needs to use it. Immigrants of school age who must acquire a second language in the context of schooling need to develop full proficiency in all language domains (including the structures and semantics of phonetics, phonology, inflectional morphology, syntax, vocabulary, discourse, pragmatics, and paralinguistics) and all language skills (listening, speaking, reading, writing, and metalinguistics knowledge of the language) for use in all the content areas (language arts, mathematics, science, and social studies). Language used in school is sometimes unique to that context, and it becomes increasingly abstract as students move from one grade to the next. Language is the focus of every content-area task, with all meaning and all demonstration of knowledge expressed through oral and written forms of language.

Cummins (1979, 1980, 1981a, 1981b) proposed one of the first theoretical models for SLA that distinguished between two basic types of language proficiency. In early formulations of his theory, Cummins labeled these basic interpersonal communicative skills (BICS) and cognitive academic language proficiency (CALP). The use of these acronyms has been questioned by some researchers (see Cummins & Swain, 1983; Edelsky et al., 1983; Rivera, 1984) as possibly leading to misinterpretation of the complex concepts that they actually represent, but the terms have become symbolic and meaningful for many people in our field as a way of distinguishing between face-to-face conversational proficiency (BICS) and context-reduced, cognitively demanding aspects of language proficiency (CALP).

In context-embedded, face-to-face communication, meaning can be negotiated and is enhanced with a wide range of paralinguistic and situational cues. Context-reduced oral and written language, on the other hand, relies primarily on linguistic cues to meaning. Cummins (1981b) elaborates his conception of these terms by creating four quadrants which best illustrate the range of possibilities in the BICS and CALP distinction. The quadrants are divided by a horizontal continuum from context-embedded to context-reduced and by a vertical continuum from cognitively undemanding to cognitively demanding.

Language proficiency required for school tasks can incorporate the whole range of skills in all four quadrants, but it is especially in school that students need to develop context-reduced and
cognitively demanding aspects of language in order to function successfully in the classroom. In his continuing refinement of the BICS/CALP distinction, Cummins (1984) defines CALP as aspects of language that involve cognitive processes at the higher levels of Bloom’s taxonomy of educational objectives for the cognitive domain: analysis, synthesis, and evaluation (see Bloom & Krathwohl, 1977).

Analyzing rate of attainment of CALP in the second language, Cummins (1981a) found that whereas it generally takes students 2 years to master BICS in the L2, young children with little or no formal schooling in their L1 require approximately 5-7 years to reach the level of native speakers in CALP in the L2, as measured on standardized tests. Cummins (1981b) emphasizes that older children’s common underlying proficiency in their first and second language assists with the process of SLA. Thus, for older students, many academic skills and concepts acquired in the L1 transfer to the L2, and the process of SLA occurs at a faster rate than for younger children.

Summaries of the literature on age and rate of attainment of the L2 (Krashen, Long, & Scarcella, 1979; Krashen, Scarcella, & Long, 1982) confirm that older children and adults initially acquire many aspects of the L2 faster than younger children. However, with acquisition of pronunciation and influence of the socioaffective filter (Dulay & Burt, 1978; Krashen, 1982), adults sometimes experience problems with SLA, so that overall, with time, younger acquirers tend to attain higher levels of proficiency in second languages than those who begin SLA as adults.

This study was designed to follow up Cummins’s research and Krashen, Scarcella, and Long’s literature synthesis on age variables, rate of attainment, and influence of L1 CALP development on the process of L2 CALP development. In this study, Cummins’s theoretical framework was used as a basis for analysis of the type of L2 proficiency needed for academic purposes. The measures available for this study, however, were not tests that assessed all aspects of language proficiency.

The standardized tests required only the language skill of reading to be able to answer the questions. Metalinguistics knowledge of the language was assessed in the language arts test, and ability to classify, generalize, manipulate ideas, problem solve, and apply knowledge in each of the content areas was assessed in the reading, social studies, science, and mathematics tests. Measures used thus assessed some aspects of L2 CALP development as well as content-area achievement of students. Since Cummins’s (1981a) data were based on 1,210 limited English proficient (LEP) students in Grades
K-9 in Canada, this study sought to extend the literature by analyzing 1,548 LEP students in Grades K-11 in a U.S. context.

METHOD
Sample and Setting

Cross-sectional data from 1977 to 1986 were gathered on language minority students attending a large U.S. public school system on the East Coast. At the time of the study, language minority students represented 11% of the total student population in this school district. Predominantly an affluent suburban area connected to a large metropolitan hub, the district also included a few pockets of low-income families. Almost all the language minority students in the district were relatively recent immigrants to the United States, with over 75 different languages and over 100 different countries represented.

Approximately 65% of the subset of language minority students who received special ESL instruction qualified for free or reduced-price lunches, indicating that upon entry, a majority of these students came from low-income families, as measured by U.S. standards. However, a large percentage of the immigrant families who settle in the district come from an upper or middle-income background in their country of origin, and they bring strong aspirations of upward mobility to their new home, with many achieving a more middle-class standard of living in the United States within the first 10-15 years of their arrival. Thus, the language minority population could best be categorized as lower to middle income, with strong middle-class aspirations.

In educational background, the large majority of language minority students in the district entered school at grade level, with parents having come from middle-class or upper class backgrounds in their home countries. In just the last 3 years, the district has experienced a small but increasing influx of language minority students with little or no formal schooling in their native language.

Subjects for this study, a total of 1,548 students, included all language minority students who were placed in beginning-level ESL classes upon entry and remained in the school system for several years. One subset of this population was not included in the study, those students who tested below grade level in L1 skills during placement testing upon entry, as well as older students with little or no formal schooling in L1.

This study was restricted to a group of LEP students with these particular characteristics for two reasons. First, it was assumed that
an “advantaged” group of LEP immigrants, those with a middle- to upper class background in their home country and a strong educational background in their LI, would be more likely to reach the L2 proficiency and content-area achievement of native English speakers faster than LEP immigrants who had a lower class background or were below grade level in LI skills. Second, since the amount of time required to reach L2 proficiency can vary significantly depending on level of English proficiency at which a student begins study all in English and level of formal schooling in the LI, it was decided to control for these two variables.

Assessment for controlled variables. Upon entry, a placement-testing procedure determined students’ level of English proficiency and basic LI literacy and math skills. After a placement staff member conducted an interview with the student and his or her parents or relatives, the student was given a locally developed placement test to measure listening, speaking, reading, and writing skills in English and ability to do math computation. The math tests in basic computation, decimals, and fractions were written using six of the major variations in world notations of math symbols. For measurement of basic literacy in the LI, the student was asked to read a short paragraph and to write a short language sample in the native language. The placement center staff had materials in each language to make a rough judgment that the student had had at least some minimal formal training in the LI. Bilingual staff were available to analyze in more depth Spanish, Vietnamese, and Korean language samples, which were among the largest minority language groups of the district.

A decision to place a student below grade level was based on ability to produce a short LI writing sample and ability to perform math calculations at grade level for the student’s age. A third criterion for grade placement was a student’s transcripts, which would indicate interrupted or little formal schooling or very low grade point average. Placement staff had extensive references to conduct transcript analysis. Students were rarely placed more than one grade level below their age-appropriate grade.

Characteristics of sample chosen. Students in the advantaged LEP sample chosen for this study exhibited the following major characteristics upon arrival and entry into schooling all in English: (a) They were from over 100 different countries and spoke over 75 different languages, with no single language predominant, although Spanish, Korean, and Vietnamese speakers represented the largest language groups; (b) the students were of lower to middle-class background, as measured by U.S. economic standards, but they had
strong middle-class aspirations and bad come from middle- or upper class backgrounds in their home countries; (c) they had little or no proficiency in English; and (d) they were at or close to grade level in academic skills in their L1. In social class and educational background in their home country, these LEP students would be expected to have an advantage over their LEP peers who came from lower class backgrounds or those who had had interrupted or little formal schooling.

**ESL program characteristics.** In this school system, once each LEP student was tested and placed in the appropriate grade level, the student was given special assistance from ESL teachers, who provided English language arts instruction appropriately structured and sequenced to build a student’s proficiency level in English. Since there were no self-contained ESL classes, students spent only part of their day with specialized ESL teachers and the rest of the day in the mainstream classroom. ESL staff assisted with the development of BICS in English, as well as with CALP development with some instruction in the content areas. A few ESL content-area classes (ESL algebra, ESL biology, etc.) were taught at the secondary level. Students did not receive any formal instruction in their L1 at school.

Students were taught by ESL staff until staff members felt they could function full-time in the mainstream. For exit from the ESL program, students were administered the California Achievement Test (CTB/McGraw-Hill, 1986), and ESL staff rated them on a locally developed scale focusing on students’ development in English of oral comprehension, oral expression, reading and writing skills, and study habits. Most students were generally mainstreamed from the ESL program within 2-3 years of entry into the school system. Mainstreaming did not imply that the ESL staff believed that students had achieved CALP in English but that they were sufficiently far along in their growth in CALP skills in English to continue their development in a mainstream class.

**Research Questions**

1. How many years of schooling all in English are required for LEP students’ achievement in reading, language arts, social studies, science, and mathematics to reach national average scores of native English speakers at each grade level?

2. How strongly does age on arrival of LEP students influence the rate of acquisition of cognitive academic second language proficiency and content-area achievement?
Data Collection and Analysis

Cross-sectional data from the years 1977-1986 for all students exited from the ESL program were collected to analyze age on arrival and rate of attainment of some aspects of CALP in English and content-area achievement. Dependent variables were scores for Grade Levels 4, 6, 8, and 11 on the Science Research Associates (SRA) Achievement Series (Science Research Associates, 1978) tests of reading, language arts, social studies, science, and mathematics. Testing was done only in English. Independent variables included age on arrival and number of years of schooling all in English, which for this sample was equivalent to length of residence in the United States. L1 literacy and math skills on arrival and English proficiency level on arrival were controlled variables.

School records, available on machine-readable media, were used to construct the data set. The initial data tape consisted of information on all LEP students who were placed in ESL, including their age on arrival, length of residence, sex, primary language, placement scores, and grade level in which they were initially placed. These records were checked for errors by running computer programs that noted unusual and obviously incorrect entries whose values exceeded the normal upper and lower bounds for that variable (e.g., an age of 25). In addition, the computer programs noted inconsistencies among the data for a particular student (e.g., a student of age 16 in Grade 2). These errors were manually corrected.

Files of SRA test data for Grades 4, 6, 8, and 11 were available from the years 1982-1986. Other files were available from 1977-1981, but since different forms of the SRA test were used in those years, the scores could not be compared with those from the new form. A set of relational data-base computer programs was employed to find test score matches from approximately 160,000 testing records for each of approximately 14,000 students who had registered for ESL classes. After only those students who entered at the beginning level of ESL proficiency and who were at grade level in L1 literacy and math skills had been selected and those students who had not remained in the school system had been eliminated, 1,548 LEP students remained in the data file with longitudinal records (4-6 years) of school performance.

With this data file, data sets were constructed consisting of all the students who had been tested in a given grade for a given number of years after ESL registration, resulting in a total of 17 different groups. Each of the 17 groups varied according to the three variables of length of residence, age on arrival, and grade level.
when the SRA test was taken. The variable of number of years of schooling all in English was defined by the following grouping of months: 12-23 months (labeled 1-2 years in the following figures), 24-35 months (2-3 years), 36-47 months (3-4 years), 48-59 months (4-5 years), and 60-71 months (5-6 years). The number of years of schooling all in English included time spent in the ESL program as well as time spent in the mainstream.

Among the 17 groups, there were no significant differences in educational background, in level of English proficiency upon arrival, or in proportional representation of sex and language background. Table 1 presents the general pattern of representation of sex and language background within the sample across the four grade levels tested.

**TABLE 1**

Percentage of Sample in Each Grade by Sex and Language Background

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<td>Male</td>
<td>47</td>
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<td>Total</td>
<td>100</td>
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</table>

For each of these groups, the means and standard deviations of the scaled standard scores in the achievement test areas of reading, language arts, social studies, science, and mathematics were computed. In addition, confidence intervals for the means were calculated. The means are displayed in graphs for each subtest and for each grade tested (school system mean scores are also given).

The means were graphically represented by converting the mean standard scores into normal curve equivalents (NCES), for
appropriate interval-level scaling. NCEs are the appropriate equivalent of percentiles to use when displaying the results in graph form because a NCE is a conversion of the percentile into equal-interval data. Unlike percentiles, NCEs are preferred for statistical analysis because arithmetical operations can be performed only on equal-interval scales (Tallmadge, 1976).

The number of cases for each group ranged from 21 (for 3 out of 17 groups) to 151, or an average of 74 per group, providing a large enough number for testing for statistical significance in the differences between groups. The school system comparison group (which included both native speakers and ESL graduates) consisted of an average of 9,258 students each year for each grade level.

As a general guideline in this study, by computing confidence intervals, it was found that a difference between group means of 6-7 NCEs was sufficient for significance at the .05 level even in the smallest of groups. In some cases, group differences of 3-4 NCEs were significant at the .01 level. Because of the large number of groups to be compared (17 groups of LEP students, plus 4 groups of native speakers, times 5 subject areas, or 105 groups total), significance tests for each possible comparison were not performed due to the high probability of making Type I errors. Only important comparisons were made and are reported here.

RESULTS

Several fairly consistent patterns in scoring among the groups of ESL graduates emerged as analysis of the data was conducted. These patterns are reported by focusing on differences among groups by (a) length of residence, (b) age on arrival, (c) grade-level achievement (by grade when tested), and (d) subject-area achievement.

Length of Residence

For LEP students in this study, the number of years of their all-English schooling was equal to their length of residence in the United States. Results are reported using the term length of residence (LOR) to be consistent with other studies using similar variables.

For over half of the comparisons between groups by LOR, the more years of all-English schooling they had, the higher LEP students in the same grade scored on the SRA tests. The increase in scores that each group achieved with each additional year’s LOR was very small and in most cases not statistically significant. However, in 15 out of 16 comparisons (with the exception of certain
groups, to be discussed), groups with LOR of 4-5 years achieved 2-8 NCEs higher than groups with LOR of 1-2 years. In 10 out of 16 of these comparisons, groups scored at least 4 NCEs higher, a significant increase overall. Exceptions to this general pattern were 5-year-old arrivals tested in fourth grade, 6- and 7-year-old arrivals tested in sixth grade, 12-year-old arrivals tested in eighth grade, and mathematics achievement across all grades, which are all discussed in later sections.

Figures 1-4 illustrate ESL graduates’ academic achievement on the SRA tests, comparing subject-area achievement by length of residence and age on arrival for each grade at which students were tested. Reported below each figure are school system means, ranging from the 59th to the 71st NCEs, with a mean of 64 NCEs for the school system across all subject areas and grades.

An example of the pattern of slightly higher achievement with each group’s added year of LOR can be seen in Figure 1 in fourth graders’ reading, language arts, and social studies scores, for students with LOR of 1-4 years. The 5-year-old arrivals, with LOR of 4-5 years, did not maintain the pattern and were a special case, to be discussed shortly. Fourth-grade LEP students scored at the 46th NCE in reading when first administered the SRA test at 1-2 years’ LOR, and the group with 3-4 years’ LOR had reached the 51st NCE, slightly above the national average. Social studies and language arts score comparisons between the same two LOR groups were higher by two NCEs (at the 52nd NCE in social studies and the 57th NCE in language arts), not a statistically significant difference.

Figure 2 illustrates sixth graders’ scores, which demonstrate the pattern even more consistently in reading, language arts, science, and social studies achievement. The 6- and 7-year-old arrivals with LOR of 4-5 years and 5-6 years respectively did not maintain the pattern and are discussed shortly. The group in the sixth grade with LOR of 3-4 years increased their scores over the group with LOR of 1-2 years by 5 NCEs on the reading test (reaching the 51st NCE), 6 NCEs in language arts (at the 62nd NCE), 4 NCEs in social studies (at the 59th NCE), and 4 NCEs in science (at the 58th NCE).

Figure 3 illustrates a similar pattern for eighth graders, with the exception of the 12-year-old arrivals, another special case to be discussed later. In comparing the eighth-grade group with LOR of 2-3 years with the group with LOR of 4-5 years, test scores increased by 3 NCEs in reading (reaching the 47th NCE), 4 NCEs in language arts (at the 54th NCE), 6 NCEs in social studies (at the 58th NCE), and 3 NCEs in science (at the 51st NCE).

Figure 4 shows little difference among groups tested in the 11th grade with LOR of 1-2, 2-3, and 3-4 years, but students in the group
with LOR of 4-5 years increased their scores significantly in comparison with those of 1-2 years’ LOR, with an increase of 8 NCEs in reading (reaching the 31st NCE), 7 NCEs in language arts (at the 42nd NCE), 3 NCEs in social studies (at the 38th NCE), and 7 NCEs in science (at the 37th NCE).

When compared with national averages at the 50th NCE overall, LEP students with age on arrival below age 12 appeared to be making good progress within their first 2 years of all-English schooling. By the end of 2 years’ LOR, all groups with age on arrival of 6-11 had reached at least the 50th NCE on the language arts, social studies, and mathematics tests. (Although only data for 8- and 10-year-old arrivals are shown in the figures for LOR of 1-2 years, this statement is based on the assumption that if the pattern of increases in scores remained consistent, 6-, 7-, 9-, and 11-year-old arrivals would also have reached the 50th percentile within 1-2 years.) The 6- to 11-year-old arrivals tested in the fourth and sixth grades had also reached the 50th NCE in science within their first 2 years’ LOR, whereas those tested in eighth grade reached the 51st NCE by 4-5 years’ LOR. On the reading test, those tested in fourth and sixth grades reached the 51st NCE at the end of 3-4 years’ LOR, but those tested in eighth grade had only reached the 47th NCE after 4-5 years’ LOR.

Although some groups of LEP students at all grade levels had reached the 50th NCE (the national average) on some subject-area tests within the 4-5 years measured in this study, when compared with the achievement levels of native speakers in their local school district, LEP students had not yet begun to reach the school system means across grade levels of 62-64 NCEs in reading, 62-64 NCEs in language arts, 60-65 NCEs in social studies, and 59-64 NCEs in science. They had, for the most part, met and excelled native speakers’ achievement in mathematics, in which the school system mean ranged from 62 to 71 NCEs across all grade levels.

### Age on Arrival

As can be seen in Figure 1, a gradual upward trend in scores for each group with an additional year’s LOR was evident on the reading, language arts, and social studies tests. Only the 5-year-old arrivals, who had been in the U.S. longer than the other fourth-grade groups, did not achieve at a level expected for their length of residence. These students scored 6 NCEs lower on the reading test than the 6-year-old arrivals, who had 1 year less LOR, reaching only the 45th NCE, 4 NCEs lower in language arts at the 53rd NCE, 9
FIGURE 1
Age on Arrival (AOA), Length of Residence (LOR), and Subject-Area Achievement for 4th-Grade SRA scores

Note: School system means for 4th grade were as follows: reading—62; language arts—63; social studies—60; science—59; mathematics—62.

FIGURE 2
Age on Arrival (AOA), Length of Residence (LOR), and Subject-Area Achievement for 6th-Grade SRA Scores

Note: School system means for 6th grade were as follows: reading—62; language arts—64; social studies—65; science—64; mathematics—70.
FIGURE 3
Age on Arrival (AOA), Length of Residence (LOR), and Subject-Area Achievement for 8th-Grade SRA Scores

FIGURE 4
Age on Arrival (AOA), Length of Residence (LOR), and Subject-Area Achievement for 11th-Grade SRA Scores

Note: School system means for 8th grade were as follows: reading—64; language arts—64; social studies—65; science—63; mathematics—71.

Note: School system means for 11th grade were as follows: reading—64; language arts—62; social studies—60; science—61; mathematics—67.
NCEs lower in social studies at the 43rd NCE, 3 NCEs lower in science at the 49th NCE, and 4 NCEs lower in mathematics at the 59th NCE.

A similar pattern was found in the scores on the sixth-grade test for 6- and 7-year-old arrivals, who were also significantly below the appropriate performance level for their LOR (see Figure 2). Comparing 7-year-old arrivals with 8-year-old arrivals, who had 1 year less LOR, both groups reached the same level on reading (the 51st NCE) and language arts (the 62nd NCE). In social studies, the 7-year-old arrivals were 3 NCEs lower at the 56th NCE, in science 3 NCEs lower at the 55th NCE, and in mathematics 6 NCEs lower at the 68th NCE. Even more dramatic drops occurred in the scores of 6-year-old arrivals, who had 2 years more LOR than 8-year-old arrivals, with scores in reading 3 NCEs lower (at the 48th NCE), in language arts 8 NCEs lower (at the 54th NCE), in social studies 6 NCEs lower (at the 53rd NCE), in science 8 NCEs lower (at the 50th NCE), and in mathematics 14 NCEs lower (at the 60th NCE).

In the eighth grade (see Figure 3), 12-year-old arrivals with only 1-2 years’ LOR achieved at a higher level than 11-year-old arrivals with 2-3 years’ LOR. In reading, the 12-year-old arrivals achieved 1 NCE higher, not a significant difference. In language arts, the two groups reached the same level. Twelve-year-old arrivals’ scores in social studies were 5 NCEs higher, in science 3 NCEs higher, and in mathematics 5 NCEs higher.

**Grade-Level Achievement**

Another consistent pattern in scores appeared in comparisons of achievement across grade levels. As can be seen in Figure 4, the 11th-grade LEP students’ test scores were dramatically lower than LEP students’ performance in 4th, 6th, and 8th grades (see Figures 1-3). The 11th graders tested after 1-2 years of English schooling scored from the 23rd to the 35th NCE on reading, language arts, social studies, and science. After 3-4 years, they had made meager progress as measured on the SRA. Finally, the group with 4-5 years’ LOR increased their scores by 4-8 NCEs, in comparison with the group with 3-4 years’ LOR, a significant increase. Eleventh-grade ESL graduates still appeared to need several more years of schooling in English beyond the 4-5 years measured here in order to reach native-speaker levels (50th NCE nationwide and 60th-64th NCE for the local district).
Math achievement of ESL graduates in the 11th grade was much higher than 11th-grade achievement in other subject areas, reaching above national averages (53rd-59th NCEs) but still lower than 4th-, 6th-, and 8th-grade LEP students’ math achievement. The 11th-grade school system mean in mathematics was at the 67th NCE.

Subject-Area Achievement

When comparing subject-area performance, Figures 1-4 illustrate high mathematics achievement, with LEP students scoring 3-6 NCEs above native speakers even in their first 2 years of all-English schooling, with the exception of 11th graders, who scored 14 NCEs below the school system mean. Scores in mathematics generally did not vary significantly across groups in each grade level, remaining basically at the same high level of achievement with each additional year of LOR. Exceptions were the 5-year-old arrivals’ drops in scores on the 4th-grade test, 6- and 7-year-old arrivals’ drops in scores on the 6th-grade test, 12-year-old arrivals’ better performance in comparison with the other 8th-grade groups, and the increased achievement of the group in 11th grade with LOR of 4-5 years. All groups with age on arrival of 8-11 years scored above the school system mean in mathematics, regardless of LOR.

Whereas mathematics represented ESL graduates’ highest performance, their lowest scores were in reading. Reading and language arts were the two subject areas directly focused on testing knowledge of L2. Performance in these two areas differed significantly, with students scoring from 5-11 NCEs higher on the language arts test, which measured punctuation, grammar, and spelling. Differences in performance among the social studies, science, and language arts tests were not for the most part significant.

DISCUSSION

Age on Arrival: 5-7

The data in this study on younger arrivals (ages 5-7) appear to support Cummins’s threshold hypothesis (1976) and his interdependence hypothesis (1981 b), which describes the “common underlying proficiency” of a student’s two languages: “To the extent that instruction in Lx is effective in promoting proficiency in Lx, transfer of this proficiency to Ly will occur provided there is adequate exposure to Ly (either in school or environment) and
adequate motivation to learn Ly” (p. 29). Cummins argues that common underlying proficiency makes possible the transfer of cognitive academic proficiency from one language to another. He suggests that there must be some minimal literacy development in the L1 for cognitive development to transfer readily to the L2 and that this minimal “threshold” level significantly aids the process of CALP development in the L2.

The data in this study suggest that this threshold involves a minimum of 2 years of L1 schooling for students’ most rapid progress in CALP development in the L2. Among first through eighth graders here for several years, only arrivals at age 5 who were tested in fourth grade and arrivals at ages 6 and 7 who were tested in sixth grade did not achieve at a rate equal to arrivals at ages 8-11, when both groups had the same LOR.

Conservatively assuming at least a minimal increase of 1 NCE for each additional year of LOR, the 5-year-old arrivals tested in fourth grade scored significantly below their predicted level of achievement, at 7 NCEs below their predicted score on reading, 5 NCEs below on language arts, 10 NCEs below on social studies, 4 NCEs below on science, and 5 NCEs below on mathematics, or an average, on all subject-area tests combined, of 6 NCEs below expected levels of performance for their LOR. Using the same measure, 6-year-old arrivals tested in the sixth grade were 5, 10, 8, 10, and 16 NCEs below their predicted scores, or an average of 10 NCEs below. Similarly, 7-year-old arrivals tested in the sixth grade were 1, 1, 4, 4, and 7 NCEs below their predicted scores, or an average of 3 NCEs below expected levels of performance for their LOR.

These 5-, 6-, and 7-year-old arrivals received the least amount of L1 schooling in comparison with all other older arrivals in the study. This was the only known variable that differentiated them from older LEP arrivals. One might question why the students who took the 4th-grade test and who had an age on arrival of 6 or 7 years did not seem to experience the same lower levels of achievement of the 6th-grade test takers whose age on arrival was 6 or 7 years. However, it is important to remember that the test at each succeeding grade level becomes cognitively more complex. Apparent lags in mastery of the content areas become more visible in the upper grades. This is especially evident in the data from the 11th-grade test.
Age on Arrival: 12-15

At first glance, the data in this study on adolescent arrivals (ages 12-15) appear to contradict Cummins’s (1981b) interdependence hypothesis, which predicts that “older learners who are more cognitively mature and whose L1 proficiency is better developed would acquire cognitively demanding aspects of L2 proficiency more rapidly than younger learners” (p. 29). Even with a strong academic background in their L1, students in this study who arrived in 7th grade at age 12 and were tested 4 years later in 11th grade were substantially below national norms in achievement in all subject areas except mathematics.

In this researcher’s opinion, however, these dramatic drops in adolescents’ scores cannot automatically be attributed to the critical period hypothesis (Lenneberg, 1967), or, to use Oyama’s (1976) term, the sensitive period hypothesis. Instead, the major difference in academic performance may be a result of the schools’ greater demands on students at the secondary level and the limited length of time LEP secondary students have to reach those levels. The 8th-grade and 11th-grade versions of the SRA differ dramatically, and these differences are strongly reflected in the high school curriculum. In this study, 12-year-old arrivals taking the 8th-grade SRA test were scoring around the 50th NCE after just 2 years’ schooling in English, whereas 12-year-old arrivals taking the 11th-grade SRA test after 5 years’ schooling in English had only reached the 31st NCE in reading, 42nd NCE in language arts, 38th NCE in social studies, 37th NCE in science, and 59th NCE in mathematics.

It must be kept in mind that these LEP students were not being provided with any L1 content instruction to help them continue cognitive and academic subject mastery at grade level while they were acquiring beginning levels of BICS and CALP in English. By the time they had acquired enough proficiency in English to receive meaningful instruction in content-area classes, they had in the meantime lost 2-3 years of CALP development and content knowledge in mathematics, science, and social studies at their age-grade level. This put them significantly behind in mastery of the complex material required for high school students. Between their third and fourth years of schooling all in English, they began to increase their achievement levels, but even projecting this increased rate (an average of 6 NCEs per year), it might require 6-8 years’ LOR for them to reach national averages of native-speaker achievement across all the subject areas. Cummins et al. (1984)
discuss this possibility in summarizing the literature on older versus younger arrivals:

The findings of Cummins [1981a] suggest that the effects of LOR tend to diminish after 5 years and thus, in terms of immigrant students’ ability to approach grade norms in L2 academic skills, there may be a critical age on arrival at about age 12, after which it will become increasingly difficult for students to catch up. (p. 79)

Another confirmation of the significant amount of L1 transfer of content knowledge to L2 and the difficulty of losing time in academic development while acquiring L2 was evident in the scoring pattern among eighth-grade test takers. Twelve-year-old arrivals with only 1-2 years’ LOR performed significantly better on the science, social studies, and mathematics tests than n-year-old arrivals with 2-3 years’ LOR. The loss of content-area instruction while n-year-old arrivals were acquiring English appeared to lower their scores, whereas the 12-year-old arrivals had the advantage of an additional year of L1 content instruction to apply to their L2 content knowledge.

In a reexamination of the data that support Cummins’s hypotheses, a number of the studies focusing on the development of CALP-related skills that contrast younger arrivals with older arrivals define older students as 8-12 years of age (see, for example, Burstall, 1975; Cummins et al., 1984; Ekstrand, 1976; Ervin-Tripp, 1974; Grinder, Otomo, & Toyota, 1962; Skutnabb-Kangas & Toukomaa, 1976). This study provides further confirmation for the hypothesis that the fastest attainment of the second language for academic purposes occurs among those whose age on arrival is 8-11 years, when these students are schooled only in the L2 after arrival.

Other studies comparing younger arrivals to teenage or adult arrivals generally focus on the earliest stages of language acquisition and on BICS-related skills (see, for example, Asher & Garcia, 1969; Asher & Price, 1967; Ekstrand, 1978; Olson & Samuels, 1973; Oyama, 1976, 1978; Patkowski, 1980; Seliger, Krashen, & Ladefoged, 1975; Snow & Hoefnagel-Höhle, 1977; Stern, 1967). Although these studies show initial faster gains in BICS among teenage and adult arrivals (as summarized by Krashen et al., 1979), few of these studies look at student gains across time.

Two studies examining CALP gains across time (Cummins, 1981a; Snow & Hoefnagel-Höhle, 1978) appear to support faster L2 development among 12 to 15-Year-old students, but both studies used the same language measures across all ages and examined absolute gains. The present study, however, focused on tests that change with each grade level, with scaled standard scores used to
one age with another. The SRA test reflects appropriate age-grade cognitive and academic development across time. None of the studies cited above measured academic gains over time in language, social studies, science, and mathematics, as did this study. A more detailed analysis of the literature on age and time variables in second language acquisition is provided in Collier (1987).

This study, therefore, supports a new hypothesis that older students who arrive at ages 12-15 experience the greatest difficulty with acquisition of the L2 for academic purposes, combined with continuing content-area development, when these students are schooled only in the L2. Such students in Grades 7-12 cannot easily afford even 1 or 2 years’ loss of cognitive and academic development in all subject areas while they are mastering English. The study data suggest that secondary-level students are most in need of content-area classes taught in the LI, in order for them to stay at grade level while they are mastering English. Another alternative might be the development of accelerated content-area classes for very advanced ESL students, covering 2-3 years’ academic work in 1-2 years. Content-area ESL classes taught at students’ level of English proficiency should also be developed for students in the early years of ESL.

Age on Arrival: 8-11

Given that the 5-year-old arrivals performed less well than their peers in 4th grade, that the 6- and 7-year-old arrivals did less well than their peers in 6th grade, and that the 12- to 15-year-old arrivals tested in 11th grade achieved significantly lower than the national average even after 4-5 years of all-English schooling, then it would appear that the 8- to 11-year-old arrivals experienced the shortest length of time for reaching the aspects of CALP development in the L2 measured by the SRA tests.

These students had reached at least the 50th NCE in language arts, social studies, and mathematics within their first 2 years of all-English schooling. In science, the 4th- and 6th-grade test takers made it to the 53rd and 54th NCEs in just 2 years, but it took 4-5 years for the 8th-grade test takers to reach the 51st NCE. In reading, the one test focused on a pragmatic measure of language proficiency, all the 4th- and 6th-grade test takers made it to the 51st NCE after 3-4 years’ LOR, but those taking the 8th-grade reading test had only reached the 47th NCE after 4-5 years’ LOR. Again, it must be remembered that the tests at each succeeding level become cognitively more complex.
Although this is a remarkable accomplishment, these advantaged LEP students with a middle-class background and adequate education in their L1 have high expectations of competing with native speakers for university admission and thus need to score higher than the 50th NCE on tests focused on language. Achievement attained by native speakers in the school district, at a mean of 64 NCEs across all subject areas, would require 3-4 more years of continuing CALP development and subject knowledge in the L2, projecting the present pattern of 8- to 11-year-old arrivals’ increases made each year.

**Reading and Language Arts**

ESL graduates’ better performance on the language arts test in comparison with the reading test was indicative of the different aspects of language that the two tests measured. The language arts test measured the more mechanical, easily taught aspects of language—grammar, spelling, and punctuation. These test items provided a measure of metalinguistics knowledge about the language, from a discrete-point, language-testing perspective (Lado, 1961).

The reading test, on the other hand, included a vocabulary test of synonyms and antonyms as well as questions following reading comprehension passages. The subject matter of these passages ranged from topics taken from content areas, to consumer skills such as newspaper editorials or advertisements, to literature. In contrast to the discrete-point focus of the language arts test, test items on the reading test were much more pragmatic (Oller, 1979), measuring a wide range of language domains through a reading passage that set an age-appropriate context for the questions that followed.

The reading test also assessed thinking skills and was more closely related to the acquisition end of the acquisition-learning continuum (Krashen, 1981). On the SRA reading test, the types of items used to measure vocabulary development and reading comprehension required the use of more complex cognitive processes, at the upper levels of Bloom’s taxonomy (see Bloom & Krathwohl, 1977). Such processes appear to take longer to master in L2 CALP development than the mechanics of language measured in the very limited SRA language arts test. The content of the SRA reading test was also more closely related to the content presented in language subtests of standardized tests for university admission and thus might serve as a more appropriate predictor of these LEP students’ future performance on standardized language tests.
Mathematics

It is encouraging that advantaged LEP students can perform so well in mathematics, even when portions of the exam include math concepts and problem solving, which rely more heavily on language skills. Although the remarkably high mathematics achievement was the exception to other content-area achievement, ESL graduates’ scores still followed the same pattern as that found in the other four content-area tests. The 5-year-old arrivals tested in 4th grade and the 6- and 7-year-old arrivals tested in 6th grade achieved significantly below their peers who had been in the United States for a shorter time. Likewise, the ESL graduates’ 11th-grade achievement in mathematics was still considerably below ESL graduates’ 4th-, 6th-, and 8th-grade achievement in mathematics.

CONCLUSIONS AND IMPLICATIONS

Across all subject areas tested and all grade levels combined, LEP students in this study arriving between the ages of 8 and 11 were the fastest achievers. Seven-year-old arrivals were slightly below this performance, with an average of 3 NCEs below projected scores for their LOR. LEP students arriving at ages 5 and 6 were projected to require at least 2-3 more years’ LOR to reach the 8- to n-year-old arrivals’ performance level. LEP students arriving between the ages of 12 and 15 were the lowest achievers, not having reached national average scores in any subject area except mathematics after 4-5 years’ LOR. They were projected to need at least another 2-3 years to reach the 50th NCE on all subject-area tests.

The data imply that 5-, 6-, and 7-year-old arrivals might acquire English for academic purposes more rapidly if they were provided a minimum of 2 years of continuing cognitive academic development in the L1. Arrivals at ages 12 to 15 cannot afford to lose time in academic instruction in the content areas taught at grade level. These subjects might be taught either through the L1 or through intensive courses taught in the L2 when students are sufficiently proficient in English to be able to work at grade level. It clearly takes a long time to acquire CALP and attain appropriate levels of academic achievement in the L2 in all the subject areas. Depending on age of arrival, it may take these advantaged LEP students anywhere from 4-8 years or more to reach the 50th NCE on standardized tests across all the subject areas. It will take them even longer to reach native speakers’ attainment in their own school district.

It should not be assumed from this study that standardized,
multiple-choice tests are an adequate measure of CALP. These SRA
tests measure only very limited aspects of the whole range of
language proficiency. For instance, they do not measure listening
comprehension, oral production, writing skills, strategic reasoning,
initiative, creativity, or many pragmatic aspects of language.
Moreover, students’ anxiety on a timed test can greatly limit their
ability to demonstrate what they know. Standardized tests have
many other limitations as well.

Nevertheless, as long as these tests are used in the mainstream as
a significant measure of academic achievement for students to
move from one level to the next or to be selected for special
academic programs, we in ESL and bilingual education need to use
such tests to assess our students’ ability to achieve in the
mainstream. These findings show that there is no shortcut to the
development of cognitive academic second language proficiency
and to academic achievement in the second language. It is a process
that takes a long, long time.

We plan to continue analyzing this extensive data base for
additional findings. Scores from future years of testing will be
added, and a time-series study will be undertaken to track each ESL
graduate. New independent variables will be added in order to
analyze differences in educational background, sociocultural
variables, and many other factors that may influence student
achievement and second language acquisition.

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Characterizing Successful Classroom Discourse for NNS Teaching Assistant Training

PATRICIA L. ROUNDS
University of Oregon

As the number of foreign-born graduate students in U.S. universities has risen over the past few years, a steadily increasing proportion of undergraduate education, especially in large public universities, has come into the hands of nonnative-speaking (NNS) teaching assistants who have limited English proficiency. Although ESL teachers and researchers have recently begun to design training programs suited to the special needs of the NNS graduate student teaching assistant, these programs are most frequently based on general-purpose language-learning materials. The suggestions offered in this article for a more specific-purpose model of instruction are based on a quantitative and qualitative discourse analysis of a corpus of videotapes of native speakers and NNSs teaching university-level mathematics classes. This analysis and the researcher’s own experience as a mathematics teacher were used to develop a characterization of what constitutes teaching discourse that is communicatively competent for mathematics, related disciplines, and perhaps other educational contexts as well.

The teaching assistantship has traditionally been the prime source of financial support for graduate students. These students act as instructors, discussion leaders, laboratory supervisors, graders, and tutors for many undergraduate courses, especially in the large public universities. As the number of foreign-born graduate students has increased over the last several years, the number of nonnative-speaking (NNS) teaching assistants (TAs) has risen proportionately. Many of these individuals are excellent teachers, but many of them—in common with many U.S.-born graduate students—lack certain pedagogical skills. Like their American counterparts, the NNS TAs at times receive scant teacher training, but unlike their counterparts, they cannot rely on some “innate”
sense of what is appropriate for American classrooms borne of years of American schooling.

This deficiency is significantly compounded by less than complete control of aural/oral English. The students of these NNS TAs often complain to their parents and to university administrators about having to take courses with teachers whom they find difficult to understand. For example, Mestenhauser et al. (1980) cite the following excerpt from the Minnesota Daily:

It is not fair for students to take a class such as math, economics, or statistics, and listen to someone whom they cannot understand lecture, but whose material they are responsible for . . . It is ridiculous to go in to obtain individualized instruction when students can’t understand the teacher to begin with. (pp. 3,4)

Complaints such as these have led legislators to introduce bills such as those recently passed by the Ohio, Florida, and Missouri state legislatures, requiring that foreign students pass an oral proficiency test before they can be assigned teaching duties.

CLASSROOM LANGUAGE AND LANGUAGE LEARNING

Although the NNS TA should certainly not be held accountable for the problems besetting higher education in the United States during the 1980s, the set of problems related to NNS TAs—commonly known as the “foreign teaching assistant (FTA) problem” (Bailey, 1984a)—has become more acute because of their increasing role in universities. Consequently, it has come to be addressed by programs in linguistic, pedagogical, and cross-cultural training ranging from 1-day workshops, to 2- or 3-week intensive courses, to semester-long seminars.

In general, however, the attempts at materials development so far reported have not clearly distinguished between the NNS graduate students’ general-purpose language needs and their specific-purpose language needs as teaching assistants, for example, the linguistic resources needed to paraphrase material that students have not understood or the ability to respond to student questions, which are often ill-framed and colloquially phrased. As a result, the ESL profession has been slow to recognize that approaches and materials for FTA training would be more appropriately based on a thorough understanding of the linguistic, communicative, and pedagogical needs of these language learners in the variety of educational contexts within which they carry out their duties. In other words, a more functional and appropriate approach to the FTA problem would be through the development of English for specific purposes (ESP) language-learning materials.
One advantage of an ESP approach is that it stresses the relevance and importance of appropriate research, including an examination of the learner's present target language performance and future goals (see, for example, the studies in Mackay & Palmer, 1981; Swales, 1985). Even NNSs who have excellent “everyday” language proficiency are language learners to the extent that they need to acquire the specific pedagogical language of the U.S. university. Many researchers, including notably Sinclair and Coulthard (1975) and Stubbs (1983), have described a certain discourse style typical of teachers; however, this research has not significantly integrated into the language-learning materials used to train FTAs. The mismatch between the everyday, or even academic, language materials used for TA training and the target pedagogical language these learners must master has recently been articulated by Swales and Rounds (1985) and Ard (1986).

Furthermore, the vast majority of studies of pedagogical discourse are based on the language of primary and secondary classrooms. Studies of university discourse that do exist have mainly been carried out with the NNS university student in mind (e.g., Candlin & Murphy, 1976; Seliger & Long, 1983), focusing on the “interpretation” of classroom language. The study reported in this article, however, focused on the “creation” of classroom discourse. This was done by characterizing the socio-educational goals of the teacher that motivate communicative competence in the classroom and by describing the classroom discourse style.

Mathematics classroom discourse was chosen for examination for two reasons. First, it has been reported (Constantinides & Byrd, 1986) that up to 50% of new graduate students in mathematics are foreign born. Given the recent popularity of undergraduate majors, such as engineering, that require substantial mathematics training, it can be assumed that there will be considerable pressure to employ graduate students from this pool to teach these “service” courses. It is also reasonable to assume that many of these students will suffer from the FTA problem and that ESL professionals will be called upon to assist this growing population.

Second, mathematics enjoys a certain mystique. It is generally conceived of as an abstract, precise, symbolic discipline, demanding economy of notation and a high level of accuracy. Consequently, it is a common belief that performance in mathematics is based on some kind of “general cognitive competence” that is more closely connected to intelligence than is the case for other subjects. Thus, performance in mathematics is considered to be less affected by teachers’ attempts to improve effort and motivation among less successful students (Lorenz, 1980).
A popular belief following from this conclusion is that all a math teacher need do is demonstrate how to solve problems: One does not need to know a lot of English to learn mathematics and presumably not that much more English to teach mathematics, since it is “just a lot of symbols.” I would like to suggest that effective mathematics teaching is a more humanistic activity than is often supposed and that it can best be understood by exploring what constitutes communicative competence in mathematics classrooms.

Since many of the sciences depend heavily on mathematics, what we learn about how mathematics is taught should assist us in understanding how other classes in the hard sciences are taught, although we must reserve judgment until further specific-purpose studies are carried out in those areas. The intention of this study was to develop more of an appreciation of what goes on in the classroom “black box” (Long, 1980), especially an appreciation of how a teacher can and should go beyond the basic teaching of content. This appreciation, in turn, should assist us in advising NNS teacher-trainees and in designing and evaluating language-learning activities appropriate to the specific-purpose needs of FTAs.

SUBJECTS, METHODOLOGY, AND SETTING

A corpus of five 50-minute videotapes of native and nonnative English-speaking teaching assistants was analyzed. The use of the descriptor assistant in this case is somewhat misleading, since these teachers did not “assist” anyone but were the sole teachers for the course—first- or second-term university-level calculus for nonmajors—with full responsibility for teaching the class, planning lessons, testing, assigning grades, and so on. All classes were observed and recorded during the second week of the course in order to maintain consistency across subjects with respect to degree of familiarity with their particular group.

For purposes of anonymity, the TAs selected for taping (who were all male) are referred to in this article as Al, Mohammed, José, George, and Lee. Al and George were native speakers (NSs) of English; Mohammed, of Arabic; José, of Spanish; and Lee, of Chinese.

These individuals were selected for this study by the Mathematics Department’s TA supervisor, who was asked to identify 4 TAs: 2 whom he judged to be successful (Al and Mohammed) and 2 whom he judged to be less successful (George and Lee). He requested that we include an additional TA (José). The latter did not seem to have many problems in class, but the supervisor perceived him to have
some language difficulties, mostly related to pronunciation. The supervisor’s holistic teacher ratings were based on his observations of the TAs, knowledge of the end-of-semester evaluations provided by the students, and the quantity of complaints that were filed with his office.

I concurred with these overall categorizations based on my study of the videotapes, comparisons with my observations of other class sessions taught by other TAs, and my own experience as both a student and teacher of mathematics. This rating of relative success of the TAs’ teaching performances will aid us in the following analysis of what constitutes effective mathematics discussion.

In addition to transcripts of the actual classes, the TAs, their students, and the supervisor were invited to comment on the tapes in separate review sessions. The reviewers were asked to comment whenever they saw something that was “unusual, interesting, or problematic.” This was done to establish what the participants identified as significant and to avoid what Douglas and Pettinari (1982) term a “deficit approach” to analysis, in which the researcher has sole responsibility to prejudge what constitutes a pertinent episode or what should be occurring at any point.

These sessions were audiotaped, and transcriptions of the comments were interpolated with the transcriptions of the videotapes, providing a running commentary on the unfolding scene. This approach to interpreting data is similar to research techniques employed by Erickson (1975, 1979), Erickson and Shultz (1982), Frankel (1984), Frankel and Beckman (1982), and Selinker and Douglas (1985), in which the analyst attempts to understand an event by studying it as it unfolds naturally and by obtaining retrospective commentaries from the actors.

In effect, all these TAs worked within the same set of guidelines: The amount of mathematical information they had to “cover” in a term was strictly required by the department; the order in which they treated the information was largely determined by the designated textbook; the rate at which they treated the material was regulated by the departmental midterm and final examinations. All the TAs in this data sample were observed to use the same methodology, “chalk and talk,” in which the teacher stands in front of the room engaged in an apparent monologue while the students take notes.

Yet, within this set of guidelines, some of the teachers were adjudged to perform more successfully than others. The following discussion provides some initial quantitative comparisons of the teaching performances of the TAs. These are followed by a more qualitative comparison of 2 TAs’ explanations of similar calculus problems.
RESULTS AND DISCUSSION

Use of We

By employing quantitative and qualitative research methods, Bailey (1982, 1984b) has developed a TA typology ranging from least highly rated to most highly rated: Type 1—active unintelligible TAs, Type 2—mechanical problem solvers, Type 3—knowledgeable helpers/casual friends, Type 4—entertaining allies, and Type 5—the inspiring cheerleaders. According to Bailey, one of the behaviors that differentiates the types is an increasingly pronounced engagement with students. For example, the teaching style of Bailey’s Type 2 TAs essentially consisted of demonstrations and noninteractive explanations of homework problems, whereas the teaching style of Type 3 TAs “established some positive affect in their classrooms” (1984b, p. 122), and Type 4 TAs indicated a “one-of-the-group” attitude. Especially among Types 3-5, Bailey noted an increase in the use of inclusive pronouns such as we, our, let’s, and us as one type of linguistic evidence for increased interactivity linked with successful teaching.

The present data confirm Bailey’s findings. A count of the number of occurrences of the personal pronouns I, you, and we in this data sample indicates that we occurs more frequently than I or you for all the TAs (see Table 1). Among the more successful TAs, we occurs 62%-65% of the time, or approximately three times more frequently than either of the other personal pronouns; the less successful TAs used we only 40%-50% of the time. Furthermore, José,

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<th>I</th>
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<th>you</th>
<th>%</th>
<th>we</th>
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<td>n</td>
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<td>&quot;More successful&quot;</td>
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<tr>
<td>NS (Al)</td>
<td>123</td>
<td>21</td>
<td>94</td>
<td>16</td>
<td>354</td>
<td>62</td>
</tr>
<tr>
<td>NNS (Mohammed)</td>
<td>90</td>
<td>20</td>
<td>69</td>
<td>15</td>
<td>292</td>
<td>65</td>
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<tr>
<td>&quot;Less successful&quot;</td>
<td></td>
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</tr>
<tr>
<td>NS (George)</td>
<td>65</td>
<td>27</td>
<td>78</td>
<td>33</td>
<td>96</td>
<td>40</td>
</tr>
<tr>
<td>NNS (Lee)</td>
<td>35</td>
<td>21</td>
<td>50</td>
<td>29</td>
<td>85</td>
<td>50</td>
</tr>
<tr>
<td>&quot;Somewhat intermediate&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NNS (José)</td>
<td>16</td>
<td>6</td>
<td>47</td>
<td>16</td>
<td>225</td>
<td>78</td>
</tr>
</tbody>
</table>

Note: Percentages may not total to 100 due to rounding.
the problematic TA, used 225 we’s during one class session, accounting for 78% of his total personal pronoun use. These findings suggest that a greater use of we in some way correlates to communicative competence in the classroom.

Linguists (e.g., Benveniste, 1966) have pointed out that personal pronouns are crucial to intersubjective communication: They are the means language provides for constituting the roles of speaker and addressee in face-to-face interaction. That is, I denotes the speaker in a certain instance of discourse; you denotes the addressee. We, on the other hand, has at least two domains of reference: an inclusive we, in which the addressee is included with the speaker (I + you), and an exclusive we, in which the addressee is excluded (I + they) (Haas, 1969; Spiegelberg, 1973).

Rounds (1985, 1987) presents an analysis of we in context that indicates that the they in exclusive uses of we in these classrooms is mathematicians, and the you in inclusive uses of we is students. Thus, we is an egalitarian pronominal choice: Teachers may include themselves in the group consisting of mathematicians or in the group consisting of students without change of referential sign. By using we in this fashion, the teacher can avoid constantly reminding students of their relative differential status.

A further analysis of we in discourse contexts (Rounds, 1985, 1987) presents evidence that teachers use we when I, you, or one are the usual deictics. For example, when reviewing some information presented in a previous class, Al said, “We said that . . .”; when announcing his intention to discuss homework problems, he said, “[I] want to look at some of the problems we had for today . . .” In the former example the teacher (I) did the saying, and in the latter the students (you) had the homework problems. In both cases, the speaker redefined the semantic domain of the plural pronoun to denote either speaker or hearer.

Motivations for the high use of we are in line with Bailey’s observational studies. P. Brown and Levinson (1978) have shown how the choice of a particular personal pronoun form is related to factors such as the user’s role and perceived relationship to hearers. By using we, teachers can signal solidarity with their students while covertly maintaining a certain semblance of power. This is because teachers do not need to change personal pronoun when changing group identity, as they might when using a language that has the potential to encode grammatically the power/solidarity dimension (R. Brown & Gilman, 1960).

P. Brown and Levinson (1978) attribute such pronoun use to universals of politeness. Although this may be true for ordinary
conversation, which they studied, Rounds (1985, 1987) suggests that educationally motivated considerations—such as balancing the teacher’s need to negotiate his or her role with the need to develop consensus for pedagogical ends—may influence certain personal pronoun use. Thus, a more encompassing term for this language behavior might be found within Habermas’s (1979) framework of a “universal pragmatics,” in which the central theme is that consensual action rests on a background of reciprocal claims and mutual recognition of truthfulness, comprehensibility, and appropriateness.

In general, it appears that the use of inclusive pronouns is a positive factor in terms of interactivity. However, teacher trainers should exercise a certain degree of caution when advising FTA trainees on this point. If the use of we derives from a fundamental perception of role and power, would grafting we onto otherwise noninteractive discourse be a false and counterproductive activity? It is not known, for example, how students would react if the so-called mechanical problem solver were simply to add an overlay of we’s to an otherwise monologic approach to teaching. Would the students react as we do to the nurse who asks, “And how are we feeling today?” Furthermore, such concrete advice might give less successful TAs the impression that all they have to do to be better teachers is to say we. This conclusion is obviously simplistic but may be attractive to individuals who are not truly motivated to improve their teaching. We is an effect of interactive teaching but can hardly be used to cause it.

Talk and Silence

The five 50-minute class sessions that comprise the focus of this discussion were all conducted in precisely the same fashion. The teacher stood in front of the room and talked while the students remained in their seats throughout the class period taking notes. The students rarely asked questions and generally provided only the briefest of answers. However, despite the fact that the teacher maintained the floor almost exclusively, there were sizable differences in the amount of talk teachers used to accomplish similar pedagogical functions in comparable class periods.

Ali, the more competent NS teacher, produced approximately 7,700 words during the class session, whereas Lee, one of the less competent NNS teachers, produced only about 2,400 words during a comparable period (see Table 2). In other words, Ali talked about three times as much as Lee. Mohammed, the other competent
teacher, also produced in the range of 7,000 words—much more than Lee and even more than NS George's 5,600 words.

Since these figures represent number of words per uniform class period, these observed differences can be attributed to either differences in rate of speech or in amount of silence. Comparable speech samples indicate the rate of words per minute for these speakers averages from 101 to 170, with Lee again the least fluent. Pimsleur, Hancock, and Furey (1977) have determined that 130 words per minute or fewer is considered slow for teaching purposes; Lee's considerably lower average rate could have had serious repercussions in terms of information flow if not for the fact that the blackboard served as a supplementary channel of communication. In any case, there would seem to be some optimal rate at which classroom talk should proceed and fill the allotted time. The 7,000-word figure achieved by the two more competent teachers may just be a coincidence, or it may be significant as an average optimal verbalization.

In terms of student expectation, however, rate of speech per se did not seem to be a problem. What students did comment on was silence. In an essentially monologic teaching situation such as these classes, the responsibility for keeping the talk moving lies with the teacher. Students do not take much responsibility for maintaining talk except for asking occasional questions and answering when the teacher asks a question, and even these questions generally require minimal responses. If, therefore, the teacher is responsible for the talk, the teacher is also the producer and manager of the silence.

Using the average rate of delivery, which was determined by averaging the speech rate in three continuous speech samples for each subject, one can project the number of words that each individual would produce in a 50-minute monologue (see Table 2). Comparing these figures to the actual number of words per class,
determined by counting, we find that Al and Mohammed (the more successful teachers) actually came very close to projected verbalization, whereas the other three teachers’ performances differed greatly from projected numbers. This difference is at least partially due to the different ways in which these individuals managed silence in their classrooms.

Scollon (1985) points out that much of the research into silence (Feldstein, Alberti, & BenDebba, 1979; Siegman, 1979) relies on the metaphor of the machine: “The normal state of the machine is thought of as a steady hum or buzz, with hesitation or silences indicating trouble, difficulty, missing cogs, and so forth” (p. 26). This characterization is problematic, however, since from the perspective of the machine, all silence is negatively perceived. As a balance, researchers such as Basso (1970), and more recently, Scollon and Scollon (1979, 1981) and many of the articles in the Tannen and Saville-Troike volume (1985), have begun to argue for a more comprehensive view of silence as differentially employed and valued in different contexts.

Within the context of the classrooms observed for this study, there appeared to be three categories of silence, which were designated administrative, strategic, and empty. The first type, administrative silence, occurred in conjunction with certain aspects of classroom activity and seemed to have its own subtypes. For example, when teachers reviewed homework problems, they typically asked students to nominate problems for discussion, then looked up the problem and read it. While they were doing this, a silence often occurred.

A second kind of administrative silence took place in conjunction with board work, which is essential to a mathematics class because it provides a written record of the ongoing discussion. Three strategies produced a kind of rhythmic relationship between the two modalities of speaking and writing on the board: (a) Teachers might first announce the mathematics and then write it; (b) they might write and then announce; or (c) they might announce and write simultaneously. In each of these three cases a certain amount of silence occurred as the teacher took time to write before or after saying what was written or as the production of the written mode “caught up” to the spoken mode. Occasionally a teacher would write something on the board without redundantly announcing it. This kind of silence was more noticeable with Lee, who often wrote and then backed away from the board to allow students to see what he had done without ever saying it out loud. This board-writing strategy produced extended periods of silence and may partially account for Lee’s lower number of words per class period.
Another type of administrative silence occurred when the teacher performed such duties as erasing the board, collecting papers, or walking from one part of the board to another, which he might do, for example, if he wanted to refer to a previous point in response to a student question. Sometimes a teacher would continue to maintain the stream of talk while performing these mundane classroom duties. Al and Mohammed tended to talk (almost compulsively) at these times, whereas Lee seemed to be comfortable with allowing a silence to fall over the classroom. Using the metaphor of the machine, Al and Mohammed appeared to choose to “keep the machine running,” whereas Lee let it come to a stop. From another point of view, Lee may have simply been avoiding extraneous talk.

In each case of administrative silence, the reason for the silence was related to the performance of an on-task activity, such as checking the text or erasing the board. In each case the reason for the silence was obvious to an observer.

The second type of silence did not have the same kind of apparent motivation. Strategic silence was related instead to a certain rhetorical or dramatic effect the speaker wanted to produce, such as the pregnant pause that comes just before a punch line is delivered or a major point is made. In a mathematics class these punch lines are often mathematical metastatements in which the teacher comments on or evaluates the procedure. (The linguistic form and function that these metastatements can take are discussed at greater length in the next section.)

Administrative and strategic silences appeared to be intimately related to the classroom task, whether it was erasing the board or focusing on cognitively salient aspects of the mathematical information. Empty silences, on the other hand, did not seem to function in conjunction with the workings of the classroom; instead they appeared to be counterproductive. These were the silences that indicated a dysfunction in the machinery and about which students commented unfavorably.

In a review session of Lee’s tapes, one of the first comments a student made was in regard to the silences that proliferated in this class:

You can tell that he’s having trouble communicating with the class, you know, he has to pause and get his thoughts together in the middle of his sentence and a lot of times (. . .) I don’t know (. . .) it just doesn’t, he just doesn’t hold your attention like I think a good TA should or a good teacher or a professor or anything.

1 The quotations presented here are true instances of speech, complete with ungrammaticalities, false starts, and repetitions. Untimed pauses are represented by (. . .).
Often in Lee’s talk, pauses did occur in the middle of a sentence—but in a haphazard way rather than as a dramatic pause. For example: “And because this (. ) concept (. ) are very important (. ) so (. ) we give (. ) some (. ) names (. ) for the (. ) quotient (. ) and of the limit.”

If there is not a smooth flow of talk with silences at phrase boundaries, or at what Chafe (1985) calls “focus clusters,” students may begin to lose what is commonly called the train of thought. Such silences tend to diffuse attention rather than focus it. These haphazard, or empty, silences may be one factor that contributed to the dissatisfaction evidenced by this student’s comment on Lee’s class: “See what you have to do is you have to really really concentrate on what he’s saying and the minute, you know, that you stop concentrating on that, is the minute your mind starts to wander.”

In ordinary conversation between English speakers, there seems to be little tolerance for silences. Unexpected silences at turn-taking boundaries may be seen as evidence of a negative response to a question or of a social statement. “Persons who want to engage in such activities as ‘giving the cold shoulder,’ ‘sulking,’ ‘insulting,’ ‘looking down their noses at,’ etc., may employ the fact that such inferences will be made from ‘no answer’ “ (Schegloff, 1972, p. 368). Studies of intercultural communication (Erickson & Mohatt, 1982; Erickson & Schultz, 1982; Philips, 1972; Scollon, 1985; Tannen, 1981) present evidence of how differences in pausing and hesitation can result in negatively evaluated behaviors. Just as silence in everyday conversation can have a negative effect on social interaction, empty silences, during which teachers are searching for the correct words and students have to “hang on,” can have a cumulative negative effect on classroom interaction. Haphazard silences confound the strategic use of silence to focus on cognitively salient points in the mathematics.

Symbolic Representation and Its Verbalization

In the textbook explanation of how to do a typical calculus problem such as “Find the derivative,” we find ample evidence for the belief that mathematics is abstract, precise, and highly symbolic. Figure 1, taken from Gillett (1981), provides an example. There are few English words, and these mainly appear at the beginning and end of the problem. The one phrase within the body of the problem, “The derivative at \( x \) is,” announces the answer,
which is finally arrived at three equal signs later. Between each set of equal signs, there are changes in the symbols; however, there is no verbal explanation of how the author went from one set of symbols to another. It is the readers’/students’ task to determine the reasoning for each change.

**FIGURE 1**
Sample Calculus Problem


<table>
<thead>
<tr>
<th>Example 2</th>
<th>Find the derivative of ( f(x) = \sqrt{x} ).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution:</td>
<td>The difference quotient associated with ( f ) at ( x ) (where ( x &gt; 0 )) is</td>
</tr>
</tbody>
</table>
|           | \[
|           | Q(z) = \frac{f(z) - f(x)}{z-x} = \frac{\sqrt{z} - \sqrt{x}}{z-x} \frac{\sqrt{z} - \sqrt{x}}{\sqrt{z} + \sqrt{x}} (z \neq x \text{ and } z \geq 0) \]
|           | \[
|           | = \frac{1}{\sqrt{z} + \sqrt{x}} \]
|           | The derivative at \( x \) is |
|           | \[
|           | f'(x) = \lim_{z \to x} Q(z) = \lim_{z \to x} \frac{1}{\sqrt{z} + \sqrt{x}} = \frac{1}{2\sqrt{x}} \]
|           | Since \( x \) was any positive number, we conclude that \( f \) is differentiable in the interval \((0, \infty)\). |

In mathematics classes at all levels, a typical classroom activity is discussing problems, whether they be homework problems or new problems utilizing a mathematical concept that is just being introduced. In one of the review sessions, a student commented that answer books explaining how to do problems like the one in Figure 1 are available, that she had already taken calculus in high school, and that her “very smart roommate” was generous with help on the homework. Nevertheless, the student continued to attend the class, despite being dissatisfied with the teacher. Although there were probably several reasons for this behavior, the student said: “I go to class because, um, he does examples on the board. I mean you can read it and understand but I find it more effective if, you know, I see him doing it in front of me.” Perhaps what is helpful is seeing the process worked through step by step. All the teachers observed for this study were competent at working through calculus problems step by step, but is the model presented in Figure 1 what the student had in mind when noting that she liked to “see him doing it in front of me”?

If teachers were to take textbook samples as models of explanation, they would be nothing more than “talking textbooks.”

NNS TEACHING ASSISTANT TRAINING
Such a view of teaching is based on a conduit metaphor of transaction of information, that is, teacher has information, teacher transmits information, student receives information. Although teachers must use the symbols to discuss mathematics, it is within the context of classroom mathematics talk that they attempt to align the students’ mental model (Johnson-Laird, 1983) of a mathematical concept, principle, or process to their own. At this level of mathematics instruction, students and teachers (to a greater or lesser degree) expect the teacher to “fill in the blanks” between the equal signs. An accurate estimation by the teacher of how much the student can be expected to fill in is one factor affecting communicative competence in the classroom.

A major assumption of this article is that there is more to classroom discourse than the transaction of information through “precise and efficient” symbols, that verbalization must go beyond the mere mouthing of the mathematics symbols. Even a cursory comparison of the transcripts of the classes confirms this assumption. In Figure 2, a transcript of Lee’s version of “Find the derivative” is presented. It has been divided into three sections: The first column on the right (Board Work) is a representation of what Lee wrote on the chalkboard as he was explaining the problem; the middle column (Mathematics) is a transcription of Lee’s verbalization of the board work; the left-hand column (Elaboration) is everything else he said as he was working through the problem.

FIGURE 2
Lee’s Explanation of “Find the Derivative”

<table>
<thead>
<tr>
<th>Elaboration</th>
<th>Mathematics</th>
<th>Board Work</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>How we get the derivative of a function (✓) I will give you some examples to show how to get the derivative (✓) the first example (✓) if y is x to the four y = x⁴</td>
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This problem is identical to the one represented in Figure 1. Lee chooses to use the same method to solve the problem, that is, the quotient method. An examination of the symbols indicates the same series of steps: First, an indication of the problem (line 5); second, writing down the quotient formula (line 9); next, substituting the function given for this problem in the quotient formula (line 13); then, simplifying the expression (lines 16 and 19); and finally, taking the limit of the expression and performing some further simplifying (lines 21, 25, 29).
In the previous section it was noted that periods of silence punctuated Lee’s discourse. The longer periods often occurred when he was writing on the board. For example, line 4, “$y$ is $x$ to the four,” is an exact verbal representation of the symbols in line 5. However, there is no verbal echo of line 19; instead Lee says, “so we get this.” After he says “this,” there is a silence while he writes the expression on the board and then steps back so that the students can see what he has written.

Not providing a verbal echo of board work can present difficulties for students, since class notes consist almost entirely of what the teacher writes on the board, with such note taking being facilitated by the teacher’s words. Indeed, in mathematics classes it is almost as if the students were taking dictation, furiously writing down what the teacher writes and says while working through presentations of concepts and problems. Consequently, if teachers do not say what they write, students have to see what the teacher has written before they can take notes.

This writing/speaking mismatch on the teacher’s part leads to a hearing/writing mismatch on the students’ part: Students are writing down one aspect of a problem while the teacher has already gone ahead talking through the next step. If there is a continual mismatch between the students’ and teacher’s activities, students will not be able to take advantage of the teacher’s elaboration—the talk that is not available in textbooks—because the teacher will be elaborating on aspects of the solution to which the students are not attending.

Aspects of Elaboration

**Naming functions.** The series of steps that must be followed in the solution of mathematics problems such as those in Figure 1 are linearly fixed. In classroom exposition of such problems, the writing down and more or less simultaneous verbalization of symbols was common to all the teachers observed in this study (some, however, were more consistent in their use of this classroom technique) and is doubtless common to the great majority of mathematics teachers. A qualitative difference becomes apparent, however, upon comparing textbook to teacher and upon comparing less and more successful teachers. For the following discussion of elaboration, Lee’s and Al’s transcripts (especially the portions presented in Figures 2 and 3) are drawn on substantially.

Again examining the textbook problem in Figure 1, we find that there are three verbal statements in addition to the statement of the problem: an announcement of the method used (“the difference
quotient”), the announcement of the derivative (“The derivative at $x$ is”), and finally a conclusion regarding the range of differentiability of the given function (“Since $x$ was any positive number”).

In working through a problem in class, Lee offered additional elaboration by naming each mathematical subactivity, that is, *factor, cancel, take the limit* (see Figure 2). For example, in lines 14 and 15 he says, “we factor the numerator and denominator (.) according to the formula I gave you yesterday.” Or in line 17, he says, “so we can cancel these two.” However, Lee did not go much beyond these simple instructions; his elaboration overall was minimal.

Bailey (1984b) would characterize Lee’s elaboration as the bare-bones teaching style of the mechanical problem solver. This type of teacher goes through the motions of doing problems but does not add substantially to the information already available in textbooks. There is minimal framing of the mathematics proper, perhaps in the belief that mathematics does not require much ordinary language.

If, on the other hand, we compare Lee’s elaboration with that of the most successful teacher, Al, we come away with a very different impression of the task of mathematics teaching. Figure 3 represents the first part of Al’s explanation of “Find the derivative” to approximately the mathematical point Lee reaches in line 15 of his transcript. (The transcript of Al’s explanation of this problem was too long to include in its entirety.) Although the algebra in Al’s problem was a little more complicated than that in Lee’s, Al’s basic method of finding the derivative was quite similar to Lee’s. Consequently, we might expect similar elaborations. A comparison of the elaboration columns in Figures 2 and 3, however, offers an idea of the extent to which mathematics classroom discourse can go beyond the bare bones of the required mathematics symbols. Lee’s elaborations are 1 or at most 2 lines long, whereas Al has elaboration of up to 13 lines. What additional discourse functions is Al providing?

**Marking junctures.** One function that the more successful teacher’s discourse includes is the marking of major mathematical junctures. For example, in the process of finding the derivative of a function, there is a point at which students should ask themselves if evaluating the function will lead to a meaningless expression, what is called an indeterminate form. Both the textbook and Lee’s explanation (lines 14-19) failed to mark this major juncture linguistically. Al, however, did call attention to this point by proposing the hypothetical situation: “If I try to evaluate it now if I let delta $x$ go to zero, it’s not going to work because [works through the calculations] so that’s
<table>
<thead>
<tr>
<th>Elaboration</th>
<th>Mathematics</th>
<th>Board Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>let's look at 27, I guess that would be as good a place to start as any. 27 we've got a function</td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>g</strong> of <strong>x</strong> (.) equals (.) the cube root of <strong>x</strong> . . .</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>g(x)</strong> = ( \frac{3}{\sqrt{x}} )</td>
<td></td>
</tr>
<tr>
<td>and what we want to do is we want to, find the derivative, just the general function for the derivative (.) now a lot of algebra gets involved with this and so that's one of the reasons eventually it'll be nice to have some sort of direct rules we can use (.) but if we want to figure this out we would say that the derivative</td>
<td></td>
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<td><strong>g</strong> prime of <strong>x</strong>, is equal to</td>
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<tr>
<td></td>
<td>well our definition says</td>
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<td></td>
<td>the limit, as delta <strong>x</strong> .. approaches zero of</td>
<td></td>
</tr>
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<td></td>
<td>well let's write it out as</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>g</strong> of <strong>x</strong>, plus delta <strong>x</strong>, minus <strong>g</strong> of <strong>x</strong> (.) all over delta <strong>x</strong> . . .</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ g'(x) = \lim_{\Delta x \to 0} \frac{g(x + \Delta x) - g(x)}{\Delta x} ]</td>
<td></td>
</tr>
<tr>
<td>okay so then if we plug in a particular function, we get</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>the limit, as delta <strong>x</strong>, approaches zero, of the square root of, oops cube root (.) of <strong>x</strong>, plus delta <strong>x</strong>, minus the cube root of <strong>x</strong>, all over delta <strong>x</strong>,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ \lim_{\Delta x \to 0} \frac{\frac{3}{\sqrt{x + \Delta x}} - \frac{3}{\sqrt{x}}}{\Delta x} ]</td>
<td></td>
</tr>
<tr>
<td>now (.) How many people got it this far? (.) Okay um does anybody want to volunteer a reason why they didn't get it this far, just didn't get to this problem, or, was there something involving, interpreting this? (.) In any case this is fairly straightforward from the, definition and then now we need to evaluate this and this could be a, a bit of a trick because we're going to have to involve (.) algebraic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 3 — Continued
Al’s Explanation of “Find the Derivative”

33 trick here () so we’ve got this this is
34 x, plus delta x, so the one-
35 third () minus x to the one-third,
36 and let’s write this thing on the bottom the way we origi-
37 nally wrote it when we were doing, talking about tangents,
38 \[ \lim_{\Delta x \to 0} \frac{(x + \Delta x)^{1/3} - x^{1/3}}{(x + \Delta x)^{2/3} - x^{2/3}} \]
39 that’s the way that quantity originally came up when we first
40 talked about it (). This is this is kind of a trick but it’s
41 something you get used to, so here if we look at this, well
42 I’ve got this quantity x () and if I try to evaluate it now
43 if I let delta x go to zero, it’s not going to work because
44 these two terms will go to x to the one-third, I subtract x
45 to the one-third, this numerator is zero () this term is
46 going to be x, minus x, the denominator is zero, so that’s
47 that zero over zero indeterminate form that doesn’t give us
48 any information () well () what if I call this () Instead
49 of the first power we’re going to call each of these to the
50 three-thirds power () okay () well what I could say ()
51 is . . .

that zero over zero indeterminate form that doesn’t give us any information” (lines 43-49).

The point is that the students must avoid “that zero over zero indeterminate form” in both Lee’s and Al’s problems, and they must know that in order to do this, they must simplify the expression by algebraic manipulation. Lee did not remind students of this juncture. Al, on the other hand, repeatedly returned to this important point, as, for example, later in the same problem when he returned to this juncture:

Okay, now let’s see () what happens if I do this () so I’m not going to have that zero over zero form which is the problem in any case, so whatever I evaluate this limit to that’s going to be what I need.

The hypothetical introduction was repeated, and a second reference to “that zero over zero form” was provided.

Cohesion. Besides marking this juncture, repetition of the phrase “that zero over zero” provides cohesion at several levels. First, there
is the already noted repetition in the example above marking a return to the “important juncture” in solving the problem. If we were to look at the next problem Al did during the class, we would find that there are again references to “that indeterminate form” (a contextual synonym), thus providing an intellectual link between problems. In essence the more successful teacher simultaneously provides explicit marking of a major juncture in the problem as well as cohesion between instances of problems by reinforced repetition of pertinent phrases within and between problems.

A third level of cohesion is linguistically forged in the same way: Besides providing repetition between problems in one class, the more successful teacher provides a tie between one class session and another. This linking of classes is exemplified by Al’s initial reference above to “that zero over zero indeterminate form,” which in the attested absence of gesture to provide a situational demonstrative must refer to some previous mention. During the class observed, there was no previous reference to indeterminate form, so we must assume he was referring to a mention of indeterminate form in another class session, thus reminding students of their previous discussion.

Al was also observed to provide a linguistic bridge between one class and another at the very beginning of the session. “OK so we’re finally working up to an idea that’s calculus.” Al gives the impression of continuing some previous episode of talk by the use of such strategies, thereby developing cohesion and continuity both within a single class and between classes. Such links serve both to establish a mutual prior text and to remind students of that text.

**Information chunking.** Another way that teachers can be less like talking textbooks is by recognizing the cognitive demands their talk places on students and by trying to ease these demands through clear organization of information. Overt and explicit chunking of material and frequent use of obvious transitions are appreciated by students. In discussing George’s class, two of his students complained:

Student B: We’ve just switched over to an entirely new subject or topic in calculus (.) those are two entirely different things, no connection.

Student A: The only transition I saw was that lull where he asked if there were any questions over what he had just done. Otherwise he just jumps into it like it’s a subset of what we’ve already been doing.
To a great extent the organization of mathematical information is independent of the teacher, since the topics are sequentially determined by the textbook and the actual steps in the solution of a problem are logically determined. However, this level of organization does not seem to be sufficient for classroom discussions. An analysis of the transcript of Al’s class indicates that he embedded information in a tripartite structure familiar to students of expository speaking and writing: introduction, discussion, and conclusion. For example, in working through a problem he might summarize a particular set of steps, as when he concluded one type of algebraic operation by saying: “That’s just following this sort of rule, with x plus delta x, to the one-third playing the role of a (.) and (.) x to the one-third playing b.” Then he opened the next topic by directing the students’ attention to the consequences of these algebraic operations: “Okay well let’s see where this gets us.” This is in contrast to George, who seemed to float from one topic to the next with little explicit marking of topic boundary.

The value of information chunking is confirmed by Smith’s (1977) study, which found a positive correlation between students’ mathematics achievement and the frequency of the use of OK as a kind of punctuation mark to denote a new train of thought. Hence, explicit organization and marking of changes in topic appear to be highly valued teacher behaviors.

**Dual-function conclusions.** Throughout Al’s class there were conclusion-type elaborations such as the following:

So it turns out that everything we got here is perfectly consistent and it just is another way to look at it, it’ll be a little bit, um, a little bit more general, so it incorporates everything we’re saying here about triangles (.) so we’re going to think of it both ways (.) you need to be familiar with both of them.

To say that Al simply provided closure to that topic would miss an important function of this utterance. He not only summarized his immediately preceding discussion, but also indicated the extent of the students’ responsibility in terms of that discussion by noting, “you need to be familiar with both of them.” Not to provide a statement regarding the scope of the students’ responsibility would ignore or disregard a major concern of students, that is, the exact amount of information for which they are responsible. Assisting students in this manner provides signals marking the teacher as a positively evaluated “entertaining ally” (Bailey, 1984b), who gives tips to students to help with the task of learning.
Questions. The fact that teachers’ questions form a vital part of classroom discourse is well attested in the literature (see Winne, 1979, for a review). Besides their obvious information-seeking function, questions also serve an interactive function. The question/response pair is one example of what Schegloff and Sacks (1973) call “an adjacency pair.” When one part of an adjacency pair is spoken, someone else must complete the pair by a response, verbal or nonverbal, as soon as possible.

As Goody (1978) has pointed out, “The most general thing we can say about a question is that it compels, requires, may even demand, a response” (p. 23). The response constitutes an interaction. By asking a question, the teacher recognizes that there is someone to respond and moves away from the model of the mechanical problem solver, who demonstrates but remains passive. (A full discussion of the quality of questions a teacher may ask to further understanding is beyond the scope of this article, but see Hyman, 1979, for a variety of strategic questioning tactics that teachers can employ to motivate their students.)

Questions can have yet another function in classroom situations. For example, going back to the example of finding the derivative, there was a point at which Al turned around to face the class fully and ask, “now (.) How many people got it this far? (.) Okay urn does anybody want to volunteer a reason why they didn’t get it this far, just didn’t get to this problem, or, was there something involving, interpreting this?” (lines 26-29), Such a break from the otherwise procedural discourse of substituting one algebraic expression for another serves multiple functions. On the one hand, it provides the teacher with an opportunity to try to find out how many students were able to apply a procedure that had previously been taught and in this way to judge the success of the teaching. On the other hand, it marks a milepost in the solution of the problem. Al noted in his review session:

[I just wanted] to say that, you know, if you’ve gotten it this far there’s real work that’s been done there and that’s basic and just because you didn’t get it the rest of the way doesn’t mean you don’t have a good grasp of starting out.

In other words solving the problem to this point was better than nothing; students who had done this much had shown that they at least knew how to begin. Furthermore, a student could get partial credit on a test for showing this much work. Knowing that this work “counted” was valuable test-strategy information.
**Persuasion.** A final motivation shaping successful classroom language is summarized by Al:

[1] try to make these things seem natural and obvious (.) a lot of times [if] you can get people to think of them as natural and obvious before they think of them as hard then that seems to be half the battle right there.

Al is, in effect, pointing toward a need to use persuasion to change students’ attitudes about mathematics. The previously discussed use of personal pronouns to develop a sense of group consensus appears to be an attempt to use persuasion. Such techniques may, at first glance, seem out of place in teaching a precise and self-evident discipline like mathematics. However, math anxiety is a major concern of education researchers, and some (Reyes, 1980; Tobias, 1978) have found an inverse relationship between level of anxiety and mathematics achievement. By trying to “make these things seem natural and obvious,” Al seemed to be encouraging students to think of this discipline as not really so difficult.

Persuasion is a complex process, and according to Schmidt and Kess (1985), currently there is no generally accepted theory encompassing the entire process. However, one consistent result of the research indicates that the persuasive effect of a message is related to the similarity of the linguistic style of the message and the register of the recipient (Giles & Powesland, 1975; Sandell, 1977). These findings may account for the students’ preference for the more conversational style of Al and Mohammed to Lee’s lengthy silences and “fits and starts.”

**CONCLUSION**

A specific-purpose approach to language learning should address the concerns of those who participate in the language domain. For NNS graduate students who hope to be effective teachers, an analysis of classroom discourse provides an informed basis from which specific-purpose language materials can begin to be developed (see, for example, Swales & Rounds, 1985).

The characterization of mathematics classroom discourse presented in this article has attempted to illustrate how communicative competence on the part of the mathematics teacher requires much more than simply saying the symbols. In addition to focusing on the areas pointed out by the participants in the discourse (TA and students), this characterization was partially realized by setting aside what must be said (the mathematics symbols) from what can also be said (elaboration). The elaborative discourse was then
examined to arrive at several discourse features that appear to be a vital part of communicatively competent teaching.

The importance of these aspects of classroom discourse appears to be generalizable across a variety of teaching contexts, although the extent of this generalization remains to be investigated in other academic subcultures. At least in the case of scientific and technical disciplines involving extensive use of mathematics, discipline-specific symbols, and abstract formulations of rules, theories, and so on, there seems to be a high level of face validity in generalizing from the present study.

Thus, extrapolating from the present educational context to a more general context, successful classroom discourse can be characterized as what emerges from the teacher’s ability to develop an atmosphere of cooperative interaction and consensus—a sense of working together to achieve a common goal. Such discourse includes a clear articulation of what that goal is and when and to what extent it has been achieved. Furthermore, it arises from an appreciation, elicited by both linguistic and nonlinguistic means, of where students stand in relation to their achievement of that goal.

More specifically, communicatively competent classroom discourse is based on (a) an understanding of the student-teacher relationship expected in American university classrooms; (b) an understanding of the ability of silence to contribute to or detract from the creation of fluency; (c) an awareness of what students are doing while the teacher is performing, especially a sensitivity to their note-taking task; and (d) an acceptance of the fact that teaching involves more than proficient transmission of information and that elaboration is highly valued by students.

Specific-purpose language materials purporting to aid students in developing classroom communicative competence can offer concrete suggestions for effective elaboration. In the case of mathematics teaching (and again, perhaps for the teaching of other disciplines), this would include linguistic means for (a) naming processes; (b) overtly marking major points, both to evaluate and reinforce student achievement; (c) developing cohesion and continuity within and between classes by repetition and “linking talk”; (d) explicitly organizing topics and marking topic change; (e) stating the scope of the students’ responsibility; (f) using questions in a timely fashion; and (g) using persuasive techniques.

Although an understanding of such classroom discourse techniques could be valuable to all university teachers, native and nonnative speakers of English alike, the focus of this study has been what could be learned to assist in the development of specific-purpose language-learning materials. As trainers of NNS teaching
assistants who are responsible for an increasing amount of undergraduate education, we are, in turn, responsible to an increasing degree for improving the quality of that education. Offering a course in general-purpose language development is neither sufficient nor efficient. Understanding the nature of nonnative speakers' specific-purpose language tasks as teachers is a first step in developing effective and valid materials to assist them in creating communicatively competent classroom language.

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Analysis of Products and Instructional Approaches in Writing: Two Articles on the State of the Art

Introduction

CRAIG CHAUDRON
University of Hawai‘i at Manoa

Research on L1 writing processes conducted through the past dozen years has gradually influenced L2 research, leading to new insights into the nature of language learners’ needs, difficulties, and development in written language production. Unfortunately, with important exceptions, much of the L2 research is so recent that citations are often only of conference papers or articles in press, making access to important data and ideas relatively difficult for the practitioner. (The typical pattern is seen in Raimes, 1985, and Zamel, 1985. Of Raimes’s citations of research on L2 writing processes, only 11 out of 23 were published, and 9 of these had appeared in TESOL publications, from 1981 or later. Of Zamel’s 8 citations on L2 revision processes, 4 were published.) Nevertheless, this literature is rapidly accumulating, so there is increasing need for a synthesis of findings on writing processes to guide teachers and researchers in their work with L2 learners.

The TESOL Research Interest Section therefore chose writing as the topic of its 1986 Academic Session. The following two articles summarize research on two aspects of L2 writing research—the analysis of written products and the teaching of writing—both of which represent relatively new domains, even compared with the bulk of research in this area, which has been on the nature of L2 writing processes themselves (e.g., Raimes, 1985; Zamel, 1982). The trends revealed in these two articles should be of special usefulness to teachers and researchers because they suggest concrete ways in which L2 students’ writing can be both evaluated and taught following current understandings of writing processes.

Both of these articles take as given that writing is a process whereby the writer “discovers meaning,” instead of merely finding
appropriate structures in which to package already developed ideas. Nonetheless, each of these reviews takes a step away from a description of writing processes per se. Ulla Connor (Indiana University in Indianapolis) shows how various approaches to the description and evaluation of writing products take into account the processes that writers go through in constructing texts. Moreover, she demonstrates that complete inferences about writers’ composing processes necessarily depend on adequate analysis of written products. Connor’s exposition of how a product analysis can aid learners in their development of writing processes accords with Stein’s (1986) arguments in regard to the necessary knowledge base for the acquisition of L1 writing skills.

Vivian Zamel (University of Massachusetts at Boston) advocates consistency in approach to instruction. Because our basic understanding of the writing process includes the notion of the writer as discoverer/creator, it follows that learners of the composing process must be given optimum opportunities to develop ideas and engage in interaction with potential readers. This view accords well with current L1 surveys of research on the teaching of writing (Langer & Applebee, 1986; Petrosky & Bartholomae, 1986).

These two articles complement one another, especially if one considers Applebee’s (1986) qualifications to a radical interpretation of process-oriented instruction. He argues that our understanding of writing processes should not preclude the provision of a certain amount of structure for learners, in the form of building on the learners’ current state of knowledge (what Langer & Applebee, 1986, refer to as “instructional scaffolding”), And even though L2 learners may tend to be more mature than L1 learners at a parallel stage of linguistic development, the linguistic competencies of the former may be less positively correlated with their intellectual maturity than is the case with native speakers, so they may have unexpected limits to their ability to express their thoughts. Therefore, the provision of explicit knowledge about target language discourse forms would be a necessary component of classroom support for the writer, just as a specific knowledge base would be necessary for the writer to expound upon. Such a merging of positions does not revert, however, to a traditional product-oriented, narrowly focused instruction, as Connor and Zamel both ably illustrate.
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(*) American Sign Language read Top L-R, Bottom L-R, "Meet You In Chicago."
This article describes recent advances in writing analysis. The principal theme is that text analysis of written products complements process-centered research and is needed for an integrated theory of writing. Recent paradigm shifts in writing, linguistics, and text analysis are discussed, followed by a brief review of selected empirical studies using two different approaches, sentence based and process centered. The implications of these approaches for the teaching of ESL writing are examined.

The past decade has witnessed a major paradigm shift in composition theory and research: The emphasis has moved from the product to the process of writing. According to Hairston (1982), the product-centered, traditional paradigm stressed expository writing, made style the most important element in writing, and maintained that the writing process is linear, determined by writers before they start to write.

The process-centered paradigm, on the other hand, focuses on writing processes; teaches strategies for invention and discovery; considers audience, purpose, and context of writing; emphasizes recursiveness in the writing process; and distinguishes between aims and modes of discourse (e.g., expressive, expository, persuasive; and description, narration, evaluation, classification). Within this paradigm, research on texts and text analysis is developing rapidly. Hairston (1982), for example, includes research in linguistics and cognitive sciences as part of the new paradigm for teaching writing and emphasizes that process theory is diverse, flexible, and still emerging.

Others have articulated various synergic relationships between process and product research and have called for theories of writing integrating the two views. Phelps (1985), for example, argues for a unified theory in which the “overarching process” is the cooperative enterprise whereby writers and readers construct meanings
together. Phelps offers an analysis of the dynamic interactions between readers and writers.

An integrative theory enables us to explain the apparent paradox in some process research. Although product research has been harshly condemned by some composition theorists, descriptions of writing processes have been largely achieved by analyzing sequences of different kinds of products. Among these products have been transcripts of processes—or protocols—of writers commenting on their own writing (Flower & Hayes, 1981), analyses of students’ revisions of their own writing (Beach, 1976; Bridwell, 1980; Sommers, 1980; Zamel, 1983), and studies of teacher comments on student writing (Zamel, 1985). The role of product is becoming recognized not only in writing research, but also in the teaching of writing, in which experts are calling for a renewed interest in student texts and revisions. Sommers (1987), in criticizing the recent narrow emphasis on protocol analysis exploring writers’ mental processes while writing or revising, recommended that researchers and teachers start analyzing students’ drafts more carefully, paying attention to the development of such features as tone and personal style.

Equally important for the argument on behalf of an integrated theory of process and product in ESL, Raimes’s (1985) analyses of “think aloud” protocols of unskilled ESL writers writing essays found that ESL writers “concentrate on the challenge of finding the right words and sentences to express the meaning” (p. 247). Raimes recommends that we consider the need to attend to product as well as process. Our students should be taught not only heuristic devices to focus on meaning, but also heuristic devices to focus on rhetorical and linguistic features after the ideas have found some form. (pp. 247-248)

Recent developments in text analysis methodology are helping to integrate the product and process perspectives. By describing sequential texts within a process, text analyses are contributing to our understanding of the writing process. Text analyses are also improving the tools with which teachers and students can talk about student writing.

PARADIGM SHIFTS IN LINGUISTICS AND TEXT ANALYSIS

The 1960s, 1970s, and 1980s have witnessed major shifts in emphases in linguistics, which have yielded valuable contributions to the study of discourse, both spoken and written. Many linguists feel that traditional morphological and syntactic tools are not
enough to explain texts and that new discourse tools need to be
developed for the study of communicative texts (Dressier, 1978;

All of these theories and models of text have concerned
themselves with the processes readers and writers go through in
their attempts to comprehend and be comprehended. They differ,
however, in the degree of attention to the structural versus
developed a useful taxonomy of text-linguistic approaches to
writing: sentence-based, predication-based, cognitive-based, and
interactive approaches.

Enkvist points out that the first text-linguists worked with
sentence-based text models and were mainly interested in what
linked sentences together in paragraphs and paragraphs together
into texts. Cohesion, the overt linking of sentences, is a classic
example of such a sentence-based approach (Halliday, 1961;
perspective, developed by the Prague School linguists (Daneš,
1974; Firbas, 1966), could also be classified as a sentence-based
model. Even though functional sentence perspectivists are
interested in the role of utterances in the total communication
process, they do begin much of their work by analyzing the
sentence into parts and determining their functions in communica-
tion.

The predication-based model sees texts as particular arrange-
ments depending on a specific text strategy and maintains that the
same input can be textualized into different texts. An example of
such a model is Werlich’s *A Text Grammar of English* (1976), which
shows how text types—narrative, descriptive, expository, and
argumentative—differ in the arrangement of the same input
(words, sentences, transitional phrases, voice, etc.).

Cognitive-based text models emphasize the role of cognition in
text processing; for example, coherence is a function of the text and
of the equipment the hearer or reader brings to its interpretation.
The cognitive model, however, overlaps the interactive approach,
which stresses that to communicate successfully, writers or speakers
need to be aware of their audience and either conform to expected
patterns or purposely break these conventions for surprise effect.
The overriding theme, then, of these two approaches is that of
communicative intent. Brown and Yule (1983), for example,
underscore the importance of the reader-writer interaction in
discourse comprehension and contrast their *discourse-as-process*
approach with a *text-as-product* view. They are interested in the
function or purpose of pieces of linguistic data and also how those data are processed, both by the producer and by the receiver.

Because of the inherent overlap between these approaches, which Enkvist admits, the four categories can be collapsed into two: (a) the sentence-based approach and (b) the process-centered approach. The first category includes Enkvist’s sentence-based models, whereas the process-centered approach combines Enkvist’s predication, cognitive, and interactive categories. Using this dichotomy of text-linguistic approaches, the next section of this article describes theories as well as methods of analysis that have been successfully applied to the study of real texts, including student essays, or that suggest promise as useful areas of inquiry. The aim is to develop a unified theory of ESL writing, which includes both process and product while accounting for the many levels of language (e.g., syntax and discourse).

TEXT-LINGUISTIC APPROACHES

Sentence-Based Approach

Figure 1 lists relevant empirical studies dealing with sentence-level features, intersentential relations, coherence breaks, and functional sentence perspective. Research using functional sentence perspective is described to illustrate the potential benefits of this type of research for both process-oriented pedagogy and integrated writing theory.

Functional sentence perspective has proved to be of paramount importance for the study of coherence in writing. Even though coherence has been of increasing interest to teachers and researchers around the world (e.g., de Beaugrande, 1980; Carrell, 1982; Connor & Johns, 1987; Enkvist, 1985; Kintsch & van Dijk, 1978), it is still an elusive concept. The problem is not so much in distinguishing between coherence and cohesion, which has been done, as it is in finding an adequate definition of coherence. Phelps (1985), a rhetorician, defines coherence as “the experience of meaningfulness correlated with successful integration during reading, which the reader projects back into the text as a quality of wholeness in its meanings” (p. 21). The problem occurs, as Phelps admits, when one asks for a definition of successful integration.

Nevertheless, a few linguists have attempted, with varying degrees of success, to describe coherence, using linguistic features from the text (Connor, 1984b; Evensen, 1987; Lindeberg, 1985; Wikborg, 1985, 1987). A particularly promising attempt to describe coherence, following the theory of functional sentence perspective,
FIGURE 1
Sentence-Based Approach: Representative Empirical Studies

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<th>Concept</th>
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<td>Johns (1986)</td>
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<td>Syntactic features</td>
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<td>Grabe (1987)</td>
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<td>Connor &amp; Biber (1987)</td>
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<td>Connor (1984b)</td>
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<td>Evenson (1987)</td>
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was developed by Lautamatti (1978, 1987), who suggests that successful integration refers to the semantic relationships that exist between sentence topics and the discourse topic. Through topical structure analysis, these relationships can be studied by looking at sequences of sentences and examining how the topics in the sentences work through the text to build meaning progressively.

Lautamatti (1978, 1987) identifies three possible progressions that result in coherent discourse: parallel, sequential, and extended parallel. In parallel progression, the sentence topics are semantically identical. In sequential progression, the sentence topics are always different; the comment of the previous sentence becomes the topic of the next sentence and so on. And in extended parallel progression, a parallel progression may be temporarily interrupted by a sequential progression.

Topical structure was used by Witte (1983a), who felt that it would allow him to study the textual stimulus for revision. L1 students were asked to revise an expository paragraph. These revised passages were rated and analyzed using topical structure analysis. The analysis revealed that the low-scoring revisions exhibited a lack of clear focus (or coherence), indicating that the reviser was uncertain about what the discourse topic was. In another study, Witte (1983b), again using topical structure analysis, studied patterns in L1 freshman-level students’ writing and compared them with the quality ratings of their essays. He found topical structure analysis to be a fair predictor of writing quality.

More recently, Connor and Farmer (1985) conducted a study to examine the effects of instruction in topical structure analysis. Because of the success of topical structure analysis, the authors felt that a modified version would be useful for students as a revision strategy to check for coherence in their own writing. Teaching this revision strategy for students to use when they were revising their first drafts had positive results. Even though statistically significant differences were not obtained between the control and experimental groups in terms of (a) rated coherence of their final products and (b) quality of revision (meaning-preserving versus meaning-changing), the trend supported the potential of topical structure analysis as a tool for analyzing coherence in text and as a revision tool for students.

During the past 3 years in ESL classes at Indiana University in Indianapolis, we have used topical structure analysis to teach students to revise for coherence in their writing (Connor, 1987b, 1987c, 1987d; Connor, Cerniglia, & Medsker, 1987; Connor & Farmer, 1987). Our team, consisting of a linguist, two ESL writing teachers, and an instructional media specialist, has found topical
structure analysis to be a useful revision technique because it encourages students to consider and reconsider the text as a whole and allows them to gauge for themselves the relative coherence of their writing. Based upon empirical research evidence from Witte’s (1983a, 1983b) and Connor and Farmer’s (1985, 1987) studies as well as our experience using topical structure analysis with individual students and whole classes, we have developed an instructional sequence for teaching students how to perform a topical structure analysis and how to make it work as a revision strategy.

Following closely Lautamatti’s (1978, 1987) and Witte’s (1983a, 1983b) work, we have isolated three principles that are crucial for students to understand in order for them to perform a topical structure analysis: (a) identifying sentence topics, (b) determining sentence progression, and (c) “charting” the progress of sentence topics.

To be able to identify sentence topics, students need to have some familiarity with the arrangement of information within a sentence according to its topic and comment. Topic would be explained as simply the “main topic of the sentence,” which often, but not always, coincides with the grammatical subject of the sentence. For most essays and texts, one noun or noun phrase expresses this. The noun that expresses sentence topics can occur in many places in a sentence—beginning, middle, and end, as the sample text in Figure 2 shows. Comment would be explained as “what is being said about the topic,” which is often the grammatical predicate. For example, in sentence 4 of the sample text (see Figure 2), the sentence topic is “a child,” and the comment is “is very unlikely to survive.”

To be able to determine sentence progression, students need to know how topics can build meaning through either parallel, sequential, or extended parallel progression. As briefly explained earlier, in parallel progression, sentence topics are semantically identical (sentences 1-4 in the sample text, Figure 2). This kind of progression—repetition of a topic—is meant to reinforce the idea on the reader’s mind. In sequential progression, the sentence topics, which are always different, are typically derived from the comment in the previous sentence (sentences 5, 6, 7, and 9). This helps to develop individual topics by adding details to an idea—a requirement for good prose. Too much development of a sentence topic (if not the main idea of the essay) may distract the reader from the main idea. In extended parallel progression, the writer returns to a topic mentioned earlier in the essay (sentences 8 and 10).

After students have identified and underlined the sentence topics in their essays, they are ready to chart the progress of the sentence
When a human infant is born into any community in any part of the world it has two things in common with any other infant, provided neither of them has been damaged in any way either before or during birth. Firstly, and most obviously, new born children are completely helpless. Apart from a powerful capacity to draw attention to their helplessness by using sound there is nothing the new born child can do to ensure his own survival. Without care from some other human being or beings, be it mother, grandmother, sister, nurse, or human group, a child is very unlikely to survive. This helplessness of human infants is in marked contrast with the capacity of many new born animals to get to their feet within minutes of birth and run with the herd within a few hours. Although young animals are certainly at risk, sometimes for weeks or even months after birth, compared with the human infant they very quickly develop the capacity to fend for themselves. It would seem that this long period of vulnerability is the price that the human species has to pay for the very long period which fits man for survival as species.

It is during this very long period in which the human infant is totally dependent on others that it reveals the second feature which it shares with all other undamaged human infants, a capacity to learn language. For this reason, biologists now suggest that language is ‘species specific’ to the human race, that is to say, they consider the human infant to be genetically programmed in such a way that it can acquire language. This suggestion implies that just as human beings are designed to see three-dimensionally and in colour, and just as they are designed to stand upright rather than to move on all fours, so they are designed to learn and use language as part of their normal development as well-formed human beings.

1. a human infant
2. new born children
3. the new born child
4. a child
5. this helplessness
6. young animals
7. this long period of vulnerability
8. the human infant
9. language
10. human beings

Note: Italics indicate sentence topic.

topics. As the sample text in Figure 2 shows, sentence topics with parallel progression are placed exactly below each other. Sequential topics are indented, and extended parallel progression is aligned with the parallel topic to which it refers.

After students have made the diagrams, they should study them carefully to check for coherence of ideas and then make changes accordingly. To teach this, we first show students sample essays with varying levels of coherence and suggest ways to improve coherence in them. Initially, we also go over students’ own coherence diagrams and essays with them to help interpret them.
Students quickly become comfortable with this method and include—even if not required—topical structure diagrams as part of their regular paper “packets,” along with their prewriting, drafts, and peer comments. We think that to benefit most from this method, students should use it with their first drafts. At that point in the writing process, students are still inclined to make substantive changes.

Student response has been positive, and we have seen improvement in student writing, specifically in regard to clearer focus and better development of subtopics. We feel that topical structure analysis is a useful check of coherence in writing, which should of course be used in addition to teacher and peer comments.

Another sentence-based text-linguistic approach that explains problems of coherence in student writing is offered by Wikborg (1985, 1987) as part of a large-scale project conducted at the University of Stockholm. Working with hundreds of EFL college student essays from five different disciplines (business, literature, English, law, and journalism), Wikborg developed a comprehensive system of coherence breaks including topic-structuring problems and cohesion problems. Under the former, she lists breaks related to unspecified topic, unjustified change in topic, misleading paragraph divisions, irrelevance, and misleading disposition and headings. Under cohesion problems, she includes the types of cohesion described by Halliday and Hasan (1976) as well as instances of cohesion that do not work.

Wikborg’s (1985, 1987) system is data based rather than theory based. In other words, the researcher read through compositions, identified coherence breaks, and then classified these breaks into categories. Although the categories can be explained by linguistic and rhetorical theories, the system needs to be verified with other student writing before it can be applied to other ESL writing situations. The research, however, is impressive and should encourage continued efforts to define coherence using linguistic and rhetorical features in students’ own writing.

In summary of the contributions of the other sentence-based research listed in Figure 1, it is fair to say that these studies have emphasized the description and evaluation of written products. Patterson and Linden (1976) and Taylor (1979) have developed and applied quantitative syntactic systems for large-scale evaluations of student writing in Sweden and Australia, respectively. Biber (1984, 1985) and Grabe (1987) are interested in objective, quantifiable syntactic models geared to identifying genre types. Connor and Biber (1987) have identified preferred syntactic patterns in persuasive writing by English-speaking high school students from
three different cultures. The research on cohesion (Connor, 1984b; Witte & Faigley, 1981) was prompted by questions concerning quality of writing, thus contributing to a better understanding of evaluation criteria.

**Process-Centered Approach**

The process-centered approach is concerned with the production and comprehension of texts. Unlike the sentence-based approach, in the text analyses for this approach, sentences are typically reduced to propositions (most often defined as a relationship between a predicate and its argument, as explained below). Because many of the models were developed for the purpose of assessing the text comprehended’s understanding of texts, this approach emphasizes superstructures of texts over a linear representation of sentences as evidenced in the sentence-based approach.

Empirical research using the procedural approach has examined many aspects of texts that have implications for the teaching of ESL writing. This text-linguistic approach has been applied to a variety of genres, including persuasive writing and business letter writing, on both accomplished texts and student writing (see Figure 3). Research using semantic representations of text is described to illustrate the advantages of this approach for a writing theory that integrates product and process.

Influential approaches to the analysis of the semantic representations of texts include van Dijk’s (1977) “topic of discourse” analysis, Kintsch’s (1974) propositional analysis, and Meyer’s (1975) semantic content structure analysis. All of these analyses have in common a notion of proposition, defined in varying ways, from the relationships between a predicate and its argument (Grimes, 1975; Meyer, 1975) to the psychological status of the semantic representation involved, that is, what the hearer or reader has in mind after hearing or reading a text (Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983).

Meyer’s (1975) semantic content structure analysis (the way information is organized in a text) serves as an example of a theory of semantic representation that empirical studies have applied to the study of reading and writing. This theory views a text as a complex proposition in which each proposition fulfills some rhetorical function. As explained in more detail in Connor (1984a), the key to understanding Meyer’s system is to know what a simple proposition is and how propositions may be pieced together to develop a coherent text.
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<td>b. Speech acts</td>
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<td>c. Function of initial sentences</td>
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Test Passage

*On Being Fat in America*

Fat people in American society are often discriminated against in their jobs and forced to degrade themselves publicly, sociologists find. Two sociologists, Dr. Ardyth Stinson of New Jersey’s Kean College and Dr. Jack Kamerman, are currently studying fat people and their role in society.
According to Dr. Stimson, “We treat people who are fat as handicapped people but we don’t give them the sympathy that we give to other handicapped people. Instead, they’re completely rejected and blamed for their handicap. In addition, they’re expected to participate in what we sociologists call degradation ceremonies. In other words, you’re supposed to stand there and say, “Hee, hee, hee, don’t I look awful? Hee, hee, hee, isn’t it funny I can’t move around?”

“Some cities,” Kamerman said, “set overweight limits for teachers, and if you exceed that limit—25 percent above what the insurance tables define as healthy—you are fired.” He also said that there have been other studies that found fat people do not get promoted as easily and do not advance in a company.

Stimson recently completed a study of 40 women, and while none was even remotely medically overweight, she said 39 felt they were fat, and it caused some of them trouble in their everyday relationships.

“America has become so weight conscious,” she said, “that 40 percent of all Americans are now considered overweight.” She said there is something wrong in a society when that percentage of people are considered to be abnormal. “The problem is so great,” she said, “that if you are overweight, people no longer think of you as a doctor, a lawyer, or a teacher but as that fat person.”

In some instances, the mental pain of fat people is so severe the effect it has on their lives far surpasses the medical complications that could arise as a result of being fat. If fat men and women were treated as equals, their self-esteem would rise and they would probably lose weight.

In Meyer’s analysis, a proposition is a meaning unit which consists of a *predicate* (relator) and one or more *arguments* belonging to the predicate. A predicate may be realized as a verb, adjective, or sentence connective, and an argument may be realized as a noun, noun phrase, or prepositional phrase. For example, in the sentence *John hit Mary*, *hit* is the predicate, and *John* and *Mary* are the arguments. In Meyer’s semantic content structure analysis of texts, a text is viewed as a proposition. The relators are Meyer’s *rhetorical predicates* (e.g., explanation, response, manner). Independent sentences serve as arguments and are linked by rhetorical predicates which come in many levels, creating a hierarchy of superordinate and subordinate ideas. For example, “response” is a top-level rhetorical predicate which can have as its arguments, “problem” and “solution.” This could be called a problem-solution, top-level structure. Other top-level structures include comparison, collection of descriptions, and causation.

Several studies have used Meyer’s semantic content structure to examine the recall of texts by ESL learners. Figure 4 (reproduced from Connor, 1984a, pp. 246-247) shows a content structure diagram of an expository passage with a problem/solution, top-level structure that Connor and McCagg (1983, 1987) used in a series of studies. In the analysis, the text is broken into clauses, and each clause is assigned its rhetorical function according to the role it plays.
in conveying the overall meaning of the text. Then a content structure diagram is constructed, identifying rhetorical predicates that show how superordinate and subordinate ideas are related. In the recall experiments, the same text analysis was applied both to the test passage and to the recall protocols. This allowed comparisons of the structure and content of the paraphrases with the structure and content of the original reading selection, both in terms of what propositions were recalled and in terms of how these propositions were sequenced.

Three pedagogical implications emerge from Connor and McCagg’s research for the teaching of ESL writing. Based upon empirical findings concerning the quality of written paraphrases as rated by ESL teachers, the authors recommended teaching ESL writers to place their task in a proper context, to support main ideas with more details, and to revise freely without being bound by the order of ideas in the original passage. (Here we see a direct analogy with the revising process of good writers, who revise more extensively than do poor writers, who tend to revise at the surface level only.)

Carrell (1987), who has shown that findings from ESL reading comprehension research and from ESL composition research complement each other, suggests that “teaching ESL writers about the top-level rhetorical structure of texts” and “teaching them how to signal a text’s organizational plan through linguistic devices would all function to make their writing more effective” (p. 55). In other words, we could train students to identify and use top-level structure and types along with appropriate signaling words. In a recent pilot study, Carrell and Eisterhold (1987) found some effects for the training of top-level rhetorical structures on students’ subsequent writing quality.

Caution needs to be exercised, however, against thinking that the teaching of top-level rhetorical structures is a panacea for text analysis and for the teaching of writing. We still do not know what the proper time is to apply the knowledge of the rhetorical top-level structure in writing so that it does not restrain students’ natural writing process. Even if it were established that all good expository passages followed one of Meyer’s highest level organizational structures (problem/solution, comparison, collection of descriptions, and causation), we still would not know at which stage in the writing process those particular structures appear. For some writers, a top-level structure may serve as a heuristic that helps them generate and organize ideas, whereas for others, these organizational structures appear later. Or some topics may encourage earlier top-level structure appearance. To improve our instruction, future
research needs to continue trying to identify the role of semantic representational structure in texts and in the writing process.

Another research method that holds promise for ESL instructional practice is McCagg’s (1984, 1987) taxonomy of inferencing. McCagg developed a systematic way of accounting for propositions occurring in reading comprehension protocols that are not directly or explicitly stated in the stimulus reading passage. Based upon detailed analyses of Japanese-speaking ESL students’ recall protocols, McCagg classifies propositions into text based and reader based, each with a number of subcategories. Although McCagg’s focus has been limited to the analyses of reading recalls by student writers, the taxonomy could be used for examining and teaching coherence in student writing. It is based on a sound theory and has been tested on numerous texts.

Figure 3 shows that other empirical studies using the process-centered approach include analyses of story grammar, speech act analyses, examinations of reader-writer responsibility in business letter writing, and numerous recent analyses of the production and comprehension of persuasive discourse. The number of applications to L1 and L2 student writing in these analyses is impressive. This is encouraging for the teaching of ESL writing because all of these studies involve the process of interpretation by the reader and interaction between the writer and the reader. They offer insights that are useful for students and teachers in planning and revising discourse.

CONCLUSION

This article has shown that text analyses of writing are diverse, flexible, and still developing. Two major approaches—sentence based and process centered—were distinguished among empirical studies of writing. It is maintained that both approaches are necessary for a comprehensive theory of writing. This article has also shown that at the same time that paradigm shifts both in writing and text analysis have accelerated research into how and what students write, there has been a healthy interchange that has resulted in interdisciplinary work among rhetoricians, linguists, psychologists, and teachers. Thanks to these cooperative efforts, we are moving toward an integrated theory of writing that includes both process and product.
ACKNOWLEDGMENTS

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Process studies provide insight into the complexity of composing and may also reveal a relationship between instruction and writing. However, recent surveys of writing instruction indicate that what we have learned from process research is not informing pedagogy. Writing continues to be taught according to reductionist and mechanistic models, perhaps because of the problematic nature of incorporating change in the classroom or perhaps because process studies have typically not investigated writing in the naturalistic settings in which it takes place. Researchers have therefore undertaken classroom-based investigations, often ethnographic in nature, in an effort to understand better the links between writing behavior and writing pedagogy and to demonstrate that alternatives to the teacher-dominated paradigm are possible. This research is making us aware of the ways in which contextual factors impinge on the development of students as writers. These studies challenge traditional practices and imply a pedagogy that establishes a supportive environment in which students are acknowledged as writers, encouraged to take risks, and engaged in creating meaning. Finally, recent research suggests that teachers should become researchers themselves and investigate the relationship between teaching and writing development in their own classrooms.

Before researchers undertook their important work in the investigation of writing processes, numerous studies were conducted to determine the effectiveness of different approaches to the teaching of writing. Research of this sort, comparing one kind of instruction with another, provided us few significant findings, and these were often contradictory (Zamel, 1976). Given what we now understand about the complexity of writing, this comes as no surprise. These past efforts to establish the best method were based on the faulty assumptions that there was a best method and one just had to find it, that teaching writing was a matter of prescribing a, logically ordered set of written tasks and exercises, and that good writing conformed to a predetermined and ideal model.
The fact that these studies were not informed by an underlying theoretical perspective and failed to take into account what writers in fact do helped to precipitate the shift in research to investigations of how writers write. This paradigm shift has given us insight into the behaviors, strategies, and difficulties of writers. Process studies, consisting of in-depth case studies, interviews, surveys, and protocol analyses, have all revealed the complex, recursive, and nonlinear nature of composing and thus have challenged both methodology in composition research and previously held notions about the teaching of writing.

The thrust of process-oriented research has been to explore the underlying processes of composing, the multiplicity of constraints that writers must juggle and orchestrate to produce a text. Although this research has very definite implications for teaching, the intention of this article is not to review these studies, but to refer to them as a source of information about the writing instruction student writers have experienced. (For an overview of process studies and a discussion of applications for L2 classrooms, see Raimes, 1985, and Zamel, 1983.)

For example, Rose (1984), in his study of “blockers” and “nonblockers,” found that students who were experiencing writer’s block had learned the rules and strategies that they used from textbooks and from teachers who based their instruction on these texts. Selfe (1985), in a case study of writing apprehension, found that the writing anxiety of one particular student was linked to her limited writing experience throughout school and to her belief that teachers expected perfect papers. In a study of the composing processes of ESL students, Jones (1985, p. 114) pointed to the ineffective strategies of the monitor over-user and noted that this student had been taught by a method that emphasized the “conscious memorization” of rules and that tested the student’s explicit knowledge of these rules. The monitor under-user, on the other hand, had been exposed to instruction that focused on communication.

The following commentary, written by a former ESL student of mine about a course he was taking, is also informative.

My teacher emphasizes on the rules and limitations how to write a research paper, for example, avoiding a topic too broad, too subjective, too controversial, too familiar, too technical. She is my reader, my grader. Since she emphasizes on rules and limitations, she must grade according to these things. So, I have to follow such rules. Then in such circumstances, I feel I did not dare to strike even a step; all around me were abysses—each step was full of danger. I felt I was restricted and I
could not write any more. I felt upset and frustrated. I lost my desireness and confidence to write.

He goes onto comment that this form of instruction produces what he terms “self-defeating thinking” which affects “students’ creative thinking and writing skills. . . . They may give up almost as soon as they start, telling themselves: It is too hard for me to write; I am foolish because I can’t follow the rules; I don’t dare to write.” Even though I did not observe the classes to which this student was referring, his comments are offered here because individual students’ perceptions about and attitudes toward instruction are critical determinants in their performance as writers (see, for example, Rose, 1985c) and because these perceptions and attitudes, I believe, need to be taken into account in our attempts to teach.

SURVEYS

These examples illustrate that process studies can tell us not only about the way our students write, but also about the extent to which what we do as teachers affects their writing. As Witte (1985) has suggested, what researchers have observed and documented in their process studies may reflect the impact of previous instruction.

Recent surveys of writing instruction, however, seem to indicate that process research is not informing or transforming pedagogy. Studies of the teaching of writing make obvious the gap between research and practice and bear out Hairston’s (1982) claim that despite the apparent paradigm shift in composition, writing teachers still cling to the traditional model of instruction, “frequently emphasizing techniques that the research has largely discredited (p. 80). Data collected in a survey of the teaching of writing at the university level (Burhans, 1983), for example, reflected the persistence of current-traditional concepts, methods, and goals. This study noted the same problems in the training of writing teachers, indicating that “in whatever measure student writing problems are the result of the inadequacies of the still dominant current-traditional ideas, most writing teachers are still being trained to become part of the problems, not their solution” (p. 649).

Studies of writing instruction in the public schools (see, for example, Applebee, 1981; Tighe & Koziol, 1982) likewise reflect a general lack of awareness and application of research and theory. For example, it has been found that most instruction follows a very traditional model, consisting of exercises and drills, with very few opportunities for students to actually write. Applebee (1984), who
examined in depth the writing development of high school students, four of whom were ESL students, found that curricula were based upon a mechanistic philosophy of teaching and learning, that the most frequent types of writing assigned were low-level tasks, and that the primary role played by the teacher was that of examiner. In the case of writing instruction in both elementary and secondary ESL classes, Hudelson (1984) has pointed out that ESL literacy is dominated by procedures that strictly control writing. In these classes, language skills are hierarchically sequenced, and writing is reduced to a limited range of exercises and activities.

How teachers respond to student writing is another indication of how writing is taught, and studies of responding behavior reveal that teachers still approach students’ texts as final products to evaluate and base their evaluations on preconceived and fixed notions about good writing (Gere & Stevens, 1985; Sommers, 1982). My own investigation (Zamel, 1985) of ESL teachers’ responses likewise reflects a concern with rhetorical forms and uniform standards and reveals the extent to which teachers attend to local problems and concerns. It seems that ESL writing teachers view themselves primarily as language teachers, that they attend to surface-level features of writing, and that they seem to read and react to a text as a series of separate pieces at the sentence level or even clause level, rather than as a whole unit of discourse. In fact they are so distracted by language-related problems that they often correct these without realizing that there is a much larger, meaning-related problem that they have failed to address.

The textbooks that continue to proliferate also give us an indication of the assumptions about writing that are being promoted, for textbooks seem to influence and reflect practice (Witte, Meyer, Miller, & Faigley, 1981). These texts indicate, as Young (1978) has pointed out, the extent to which the traditional paradigm is still very much with us. Rose’s (1981) examination of textbooks reveals the “static and insular” ways in which they approach the “dynamic and highly context-oriented process” (p. 65) of composing. He found restrictive, arbitrary, and reductionist rules and formulas that atomize and “dismantle” process, transforming composition into a kind of “decomposition,” to use Moffett’s (1983) term.

An examination of ESL writing texts likewise reveals restrictive and rigid assumptions. Hudelson (1984) points to the dominance of ESL texts for children that view writing as the last skill to be practiced and mastered and that strictly control writing so that errors are avoided. And Raimes’s (1986) survey of recent ESL
composition textbooks demonstrates the minimal effect of research and emerging theory on practice. Writing continues to be reduced to a set of discrete steps and prescriptive principles that students are exhorted to follow in order to learn to write well.

A number of theories can be offered to explain why writing continues to be taught according to such reductionist models. The constraints of the educational system may impose on teachers curricular or administrative goals that are at odds with the implications of process research. Thus, even teachers who attempt to involve students in meaningful writing may find that this work is undermined by the lockstep philosophy dominating the curriculum (see, for example, Applebee, 1984). Rarely are writing teachers actively engaged in the “re-creation of curricula and materials” and challenged to reconceptualize their approaches; more often, new curricula and materials are imposed from without so that real change is not effected (Coe, 1986, p. 290). Even when teachers do make their own decisions about instruction, they may adopt one or more isolated “techniques” of a newer approach, without understanding the more fundamental changes such an approach implies.

Concern with the so-called literacy crisis and the concomitant back-to-basics movement have led to the unfortunate consequence of focusing teachers’ attention on the “minimal skills of the bare functional literacy” rather than the “maximal skills of thinking, creating and problem solving” (Cooper, 1981, p. 6). The legacies of positivistic assumptions about language processes (including that of writing), according to which language is dissected into discrete items and presented in linear sequence, are still very much with us (Raimes, 1983). To some extent, current-traditional models of teaching predominate because process-oriented teaching calls on teachers to assume a less controlling role, to give up the notion that they “own” knowledge, and to work toward goals that cannot be easily predetermined, all of which may be threatening.

Yet another problem may stem from the fact that by and large investigations of composing processes have not examined the relationship between instruction and these processes:

What has been lacking in many composition studies is a picture of the educational context: the conditions under which students write; the methods and styles of teachers; the personalities, attitudes, and learning processes of students and the many interactions among these variables. (Kantor, 1984, p. 72)
Furthermore, because these studies may involve writing about contrived topics in artificial settings, they suffer from some of the same kinds of problems that have called into question the findings of previous experimental research (Beach & Bridwell, 1984; Newkirk, 1984; Reither, 1985).

This is not to say that researchers have totally abandoned efforts to set up carefully controlled conditions in order to compare methods of instruction. In one study (O’Donnell et al., 1985), for example, researchers found that involvement in cooperative dyads can improve the quality of students’ performance on a written task. And in another study (Carroll, 1984), students of teachers who had received an orientation to process writing showed “statistically significant and educationally important increases in their writing performance” (p. 325) compared with students of teachers who had not received such an orientation. The findings of these two studies certainly suggest implications for the classroom. However, it is important to recognize the problematic nature of this kind of research due to the difficulty of distinguishing clearly between experimental and control conditions, the interpretation of criteria used for judging writing quality, the artificial conditions in which testing takes place, and the assigned writing tasks that typically leave students uninvolved.

CLASSROOM-BASED RESEARCH

Given these problems, researchers have pursued another line of investigation in their attempts to understand the links between writing behavior and writing pedagogy. With the growing awareness of how writers compose and the recognition that writing is not a matter of recording, as Hairston (1982) puts it, “an unchanging reality which is independent of the writer and which all writers are expected to describe in the same way regardless of the rhetorical situation” (p. 78), researchers of both first and second language writing have begun to look at writers and the contexts within which they write. This form of research, which entails observing students as they write in classroom settings that promote this writing, has revealed far more about writing pedagogy than previous empirically designed studies comparing different methods and approaches.

For example, Graves’s (1983) and Calkins’s (1983) ethnographic studies of writing classrooms provide us insight into not only how children develop as writers, but also how their classroom environment and situational factors impinge upon this development. In one longitudinal study of this sort, Graves (1985) describes
The sequences of writing development in children and underlines that teachers need to bring sensitivity to this development. As he points out, “major blocks occur when teachers require or expect information that has little to do with the child’s intention or knowledge base” (p. 13).

The work of Kantor (1984) further demonstrates how contextual classroom features interact with writing experiences. This ethnographic study of high school students from a variety of socioeconomic and ethnic backgrounds investigated teacher-student interaction in the writing classroom and how students’ developing intuitions about writing were dealt with. Kantor found that the nondirective and encouraging stance of the teacher and the supportive and comfortable atmosphere of this particular writing classroom, a classroom that functioned as a community of writers, helped students establish a trusting relationship with their teacher. This in turn encouraged them to take the kinds of risks necessary for the development of writing and helped make them more confident about their own intuitions about writing.

The work of Dunn, Florio-Ruane, and Clark (1985) likewise documents what happened to the writing and the writing attitudes of high school students in a classroom in which an environment for writing was established. While the teacher motivated, encouraged, and coached in an effort to open interaction among the classroom participants, the students were given responsibility in their role as writers and were provided numerous opportunities to write for a range of purposes and a variety of audiences. The authority that the teacher gave to his students became the basis for their developing authorship.

Adopting some of these research techniques, Newkirk (1984) attempted to explore the writing experiences of college freshman writers. Focusing on the development of one student, Newkirk examined the extent to which the instruction the student received fostered this development. In this particular case, the teacher’s attitude toward the student, her unwillingness to be overly concerned about the many technical problems in the student’s papers, and her ability to believe that the student would grow as a writer as she explored topics of her own choosing allowed the student to make the “breakthrough” that Newkirk describes.

The research of Sola and Bennett (1985) is of particular interest because their study reveals how curricular constraints can override a teacher’s attempt to establish the kind of writing communities described by Kantor (1984), Dunn et al. (1985), and Newkirk (1984). Sola and Bennett set out to examine the relationship between literacy instruction in a school and the social and cultural
environment of its students, in this case, students who had “traditionally not been well served by the public schools” (p. 89). They found that the teacher, who had received process training, revealed an inability to reconcile his expressed aim of trying to involve students in meaningful and motivating writing experiences with the need he felt to teach basic literacy skills. Thus, because his efforts to engage his students were subverted by his concern for teaching the official curriculum, he was ultimately dissatisfied with their work. In addition to studying writing events as they took place in the classroom, Sola and Bennett viewed these events from the perspective of the students involved, students who represented a particular ethnic community whose cultural values were at times in conflict with the curricular agenda. By describing how the students’ discourse was at odds with the purpose of school discourse, the researchers were able to understand and thus acknowledge these students’ cultural processes. The teacher, on the other hand, who had not gained such insights, seemed to be frustrating rather than facilitating these processes (p. 108).

Edelsky’s (1982) study of the development of writing in a bilingual program marks one of the first attempts in L2 writing research to examine how context and writing interact. As Edelsky puts it, writing is produced not merely in a context, but through it (p. 212). Her analysis of children’s L1 and L2 writing indicates that their literacy in both languages was promoted in a program that emphasized purposeful writing for a variety of audiences, that had children writing a great deal, and that allowed them to choose their own topics and the language in which they wrote. In such a program, Hudelson (1984) found, children whose initial literacy experiences were in Spanish were able to produce writing in English, this with no formal instruction in English.

The work of S. Diaz, Moll, and Mehan (1986) also investigated the writing of limited English proficient students as it developed in the context of instructional change. In this particular study, teachers implemented practices that promoted writing as a meaningful, purposeful, and communicative activity. Students became engaged in their own ethnographic research, collecting data from their own community, and produced writing based on their analysis of this information. Their skills, experiences, and strengths became the basis for further instruction, and responsibility for and control of learning shifted from teacher to student. In the process of this development, these students came to understand writing as a means for intelligent inquiry, for exploring the world around them. In this way students “who would otherwise do little or no classroom
writing” (p. 219) because of their language difficulties were better prepared for academic work in English.

Ammon’s (1985) research, a year-long study of third graders learning English as a second language, focused primarily on two classrooms in which children made superior gains in their ability to write English. Despite the fact that these two classrooms were very different from one another with respect to dynamics, interactions, and teachers’ instructional style, both promoted writing, unlike the other classrooms, in which language activities were reduced to teacher-dominated routines and interchanges. In both classrooms, students were encouraged to write longer texts and to write frequently, the teachers viewed writing as an act of communication about content important to the writer and the reader, and there was a clear concern for formal aspects of writing in the context of creating meaningful content. The children were thus able to learn to write in English because the instructional activities were “rich in opportunities for exposure to, production of, and reflection on English discourse . . . with guidance and feedback on topics of personal interest” (p. 82).

In an ethnographic study of the writing development of ESL community college students who were still experiencing considerable linguistic problems, D. Diaz (1985) investigated the growth and change in students in her own process-oriented classroom, a classroom characterized by free writing; daily journal entries; writing groups that provided instructive feedback; rehearsal and invention strategies; teacher conferences; drafting and redrafting; emphasis on purpose and audience; content-based compositions; and attention to error during the final stages of composing. By collecting a variety of data and student writing, she was able to observe over the course of a semester how a concern with process, a nonpunitive, student-oriented environment, and extensive opportunities to write meaningfully had not only promoted more and better writing, but had also helped these students feel more confident about their ability both to write and succeed in other L2 activities. Writing, which for these students had represented an anxiety producing, school-imposed activity, became important for its own sake, as a way of acquiring more language, as a way of learning and knowing.

In yet another ethnographic study, Hildenbrand (1985) explored in depth an ESL community college student’s attitudes, perceptions, and assumptions about writing; the composing strategies she employed; the English language instruction she received in two very different classroom environments; and the writing that was
generated in these contexts. Hildenbrand found that one classroom focused on product and mechanical correctness, thereby reinforcing this student’s already well-established apprehension about school-assigned tasks and her tendency to view schoolwork as a procedure for testing prescribed form and accurate information. In stark contrast, the other classroom, very much like the classroom described by D. Diaz (1985), emphasized the critical nature of writing meaningfully for a real purpose and audience, established an encouraging and nonevaluative environment, and provided numerous opportunities for student collaboration and peer feedback. This classroom thus helped build in the student an awareness of herself as a writer, gave her a sense of confidence and self-worth that served to counteract the negative influence of other schooling experiences, and enabled her to take risks as she attempted to articulate her thoughts and ideas in writing. This nontraditional classroom did not assign topics or expository papers but rather engaged students in self-generated topics and experiential, expressive writing. Nevertheless, Hildenbrand suggests, this approach, because it fostered an appreciation for writing as a means to explore and elaborate meaning, was particularly effective in preparing students for the demands of academic writing.

Clearly, research carried out in classroom settings is making us more aware of all the contextual factors, ones that go even beyond the classroom, that can affect not only the development of writing, but schooling altogether. Holzman (1986) argues that without taking into account who our students are and what their lives are like, we cannot hope to bring about the kinds of changes in the classroom that are necessary in order for our students to become literate, a point that Freire’s (1985) literacy campaigns have borne out. Holzman, who reminds us of Labov’s study of inner-city students whose performance in school was linked to their status in the community, stresses the importance of recognizing that influences beyond the classroom affect schooling and literacy.

I refer to studies of this sort not only because of their implications for classroom instruction, but because they underline the need for writing research that takes into account the fuller contexts of those students whose writing we are investigating. Several composition theorists (see, for example, Reither, 1985; Rose, 1985a) have recently argued for a research framework that fully explores the cognitive, affective, and situational dimensions that affect the act of writing, a framework that makes us aware of the “possible influences and interactions of other dimensions” (Rose, 1985a, p. 238). Rose found, for example, that the problem of one of his
blockers stemmed in large part from her home writing environment. Bloom’s (1985) investigation of anxious writers revealed how the writer’s “immediate writing contexts,” both school and home, the “writer’s multiple roles in these contexts,” and the “writer’s socialization into these roles” (p. 131) influence the performance of a writer.

We see similar attempts to relate the writing of L2 writers to the larger contexts in which this writing takes place. For example, Purves (1986) has furthered our understanding of “rhetorical communities” but has not investigated instruction itself. Like other studies of contrastive rhetoric (see, e.g., Kaplan, 1983), Purves’s study uses texts as a basis for analysis. Mohan and Lo (1985), pointing to the importance of instructional factors, have suggested that students’ previous educational experiences with both first and second language literacy need to be taken into account in order to make claims about L2 student texts. Matalene (1985), too, underlines the critical influence of “cultural contexts” on writing and demonstrates how culture, language, and rhetoric are “ecologically” interrelated. Irvine and Elsasser (in press), in order to explain why their students produced the kinds of texts they did, have examined the “socio-economic and political ecology” of school-sponsored writing.

To understand writing and to draw conclusions about how to teach it, research will need to recognize the multidimensional process that writing involves. As Reither (1985) has put it,

writing and what writers do during writing cannot be artificially separated from the social-rhetorical situations in which writing gets done, from the conditions that enable writers to do what they do, and from the motives writers have for doing what they do. (p. 621)

With this in mind, researchers have investigated the emotions and attitudes writers bring to the writing act (see, e.g., the collection of studies in Rose, 1985c). Future studies may need to combine a number of research methods to provide us with fuller and more genuine representations of writing experiences.

IMPLICATIONS

Recent classroom research on writing processes not only raises serious questions about many predominating classroom practices, but more important, provides us with effective alternative models of teaching. This research into the relationship between instruction and writing development has revealed what can happen to students when they are acknowledged, given numerous opportunities to write, and become participants in a community of writers. In classrooms in which risk taking is encouraged, trust is established,
choice and authority are shared, and writing is viewed as a meaning-making event, students change as writers, adopt positive attitudes toward written work, and demonstrate real growth in writing performance.

It is important to note that students in these classrooms had been accustomed to modes of instruction that reinforced narrow and limited notions about the function of writing. For example, these students had come to understand that writing was done for teachers to examine and that form took precedence over meaning (see, for example, Kantor, 1984). They had been drilled in rules and formulaic principles and had little awareness of audience and reader perception (see, for example, Newkirk, 1984). They assumed that writing was done in response to tests or homework assignments that were evaluated by the teacher (see Applebee, 1984). They came to these classrooms with an anxiety about writing and about their ability as writers because their previous instruction had based itself on absolute and shortsighted notions about good writing and how to promote this writing (see, for example, D. Diaz, 1985).

The growth and development of these students are all the more remarkable, for they had to unlearn in order to learn in this new way, to discard old approaches and expectations to take on a new kind of student role and attitude (Newkirk, 1984, pp. 143-144). They had to break from a cycle of instruction that, as Hartwell (1984) argues, keeps especially weak students from making improvement by reinforcing counterproductive and mechanistic models of writing. Given the kinds of observable changes these students were able to make, one cannot help but speculate about the far more dramatic changes that might be possible if the approaches used in these writing classrooms were adopted by entire schools.

In light of the misunderstandings about process-oriented instruction, misunderstandings that dichotomize the organic and integrated nature of writing into process and product (Zamel, 1986), the classroom studies demonstrate how product goals can be accommodated in nontraditional, student-centered environments. For example, D. Diaz (1985) and the instructor studied by Hildenbrand (1985) engaged students in a great deal of subjective and personal writing, but they were also helping them to prepare for a citywide expository writing exam. The students described by Newkirk (1984) were involved in writing about topics of their own choice, but they were also required to produce a research paper. The limited English proficient students studied by S. Diaz et al. (1986) were engaged in writing activities that promoted self-generated knowledge, but the very nature of this inquiry was
assumed to prepare students more effectively for school-based writing.

The ESL children in the classrooms observed by Ammon (1985) were expected not only to write but to demonstrate their mastery of technical features of writing in their texts. In most cases, these students made the kinds of progress expected of them. The superior writing gains of the ESL classroom studied by Ammon, as compared with the performance of the traditional classrooms, attest to the knowledge, skill, and language that can be acquired when students are provided rich, multiple, and integrated experiences that help them understand how language makes meaning.

This is of particular importance, given the fact that many ESL teachers still do not view process approaches as applicable to or appropriate for students whose English is limited: “Teachers may be inclined to retreat from English writing as an instructional activity and to focus instead on spelling, vocabulary and grammar” (Ammon, 1985, p. 83). This is precisely what happened in the case of the composition classroom studied by Sola and Bennett (1985), and this no doubt explains why writing classrooms by and large focus on basic skills. But as Shaughnessy (1977) and numerous other writing theorists have pointed out, it is in the context of creating, sharing, and valuing meaningful content, in the context of encouraging exploration and risk taking, that product concerns can effectively be addressed: “People can be more careful and get their final drafts righter when they spend some of their time unhooking themselves from the demands of audience and inviting themselves to get it wrong” (Elbow, 1985, p. 288).

Classroom research further suggests the limitations of text analysis alone because such analysis does not take into account the writer and the extent to which the writing event interacts with the writer’s intention, involvement, or previous literacy experiences. The implication of this point is that we must adopt a pedagogy that recognizes who our students are, a pedagogy that takes into consideration and acknowledges these students’ attempts at creating and negotiating meaning. Researchers and theorists have recently turned much of their attention to this implication (see, for example, Bartholomae, 1980; Kutz, 1986; Rose, 1985b).

Such a pedagogy begins with an attempt to understand the individual learner and recognizes that learning to write for school purposes is not just a matter of acquiring basic skills or remediating errors; it may also mean a whole new way of knowing, a way of knowing that involves membership in a different discourse community (Bartholomae, 1985; Rose, 1983). Such a pedagogy respects what students are at first capable of and recognizes that in
order to approximate the discourse of schooling, students must be
provided with reasons and purposes for learning in this new way. By apprenticing students into a world that is otherwise closed to
them, by allowing them to behave like scholars making knowledge,
we can help them enter this specialized discourse, as Heath’s (1983)
comprehensive and influential ethnographic work has demon-
strated. As Robinson (1985) argues, we must find ways to build
bridges between the “homes and minds of our students” and those
of the “academic world” (p. 495), and we must make this world
meaningful to them by engaging in a kind of meaning making that
excludes no one, no matter what their experiences, no matter what
their cultural frames.

The kind of intellectual inquiry these researchers are urging us to
involve our students in requires that teachers abandon their
traditional role as knowers, as wielders of power (Hartwell, 1985),
and adopt instead a stance that allows for what Freire (1985) terms
a “pedagogy of questions,” a pedagogy that opens up a genuine
investigation of topics. Taking on the role of co-inquirer in an
intellectual enterprise means that we are much more likely to come
to an understanding of the processes that underlie our own
particular students’ writing performance and to appreciate the
factors that influence this performance. By participating with our
students in their own exploration, we are more likely to discover
why our students write the way they do and what behaviors and
strategies are employed, behaviors and strategies that remain
hidden in a written text.

As we ask ourselves questions about our students’ writing
processes, we are much more likely to examine our own teaching
and ask ourselves whether the particular task or assignment has
been sufficiently clarified, whether it matches with our students’
intentions, whether it connects with what students already know. By
observing our students as their work progresses, we are much more
likely to respond to their drafts as work in progress and raise
questions that ask them to reconsider, elaborate, or extend. And
when revisions seem to have misconstrued or even ignored our
concerns, this collaborative stance is much more likely to mean that
we explore the problem and the extent to which we or other factors
may have contributed to it.

This investigation into what our students do, what we do as
teachers, and how the two interact would involve us in “thick
description,” Geertz’s (1973) term for description that takes into
account the full context of a human event, a context that in fact
researchers may not have access to. As Britton, Burgess, Martin, McLeod, and Rosen (1975) have observed:

[Teachers] can bring to the reading of a pupil’s work all their knowledge of his life and his context, realizing, perhaps intuitively, that what they already know about a [student] and his thinking when they read his work enables them to understand and appreciate something that may be incomprehensible to another. In this respect, many teachers are far in advance of anything educational research has been able to offer them. (p. 21)

Barritt (1981) reiterates this argument “Teachers who live with and within the daily situation where writing is taught have immediate, valuable information available only to outsiders after careful, extensive observation. And even then, outsiders cannot learn what teachers know” (p. 110).

By engaging in the kind of inquiry that I have been suggesting, teachers can apply what we have learned from research in the most profound way, for in the process of investigating their own practice and the extent to which this practice affects what students do, these teachers are themselves transformed into researchers, thus truly closing the gap between research and pedagogy.

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Effects of Peer Tutoring on the Second Language Acquisition of Mexican American Children in Elementary School

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The purpose of the two classroom experiments reported in this article was to examine the effects of a peer-tutoring intervention on the second language acquisition of elementary school children. English acquisition by limited English-speaking Mexican American children was measured in the first experiment, and Spanish acquisition by limited Spanish-speaking Mexican American children was measured in the second experiment. A matched-pairs experimental design was employed. Subjects were matched on an overall language proficiency score and on a verbal-interaction score. They were then assigned to treatment and control groups. The peer-tutoring treatment provided a structured setting for natural language practice between the tutor, who was a limited English-speaking or limited Spanish-speaking child acquiring a second language, and the tutee, a child fluent in the target language. It was found that in Experiment 1, there were significant group differences in frequency of English utterances to peers in a structured setting, with the difference favoring the treatment group. Correlation analyses indicated a significant relationship between English proficiency and verbal interaction in English with peers. For the children in both treatment and control groups in Experiment 2, the frequency of Spanish utterances to peers in free play decreased, resulting in the almost total absence of Spanish use. These findings suggest that peer tutoring may be an effective means of encouraging interaction between Mexican American children acquiring English and their fluent English-speaking peers. On the other hand, the study points out the difficulty of helping limited Spanish-speaking children acquire Spanish in an environment in which English is the language with considerably more status.

In spite of the obvious importance of second language acquisition for school-age children, relatively little experimental research has
focused on what can be done to accelerate children’s second language acquisition once they enter school. Although many studies have explored environmental influences on second language acquisition, including teaching methods helpful to children acquiring a second language (Oller & Richards, 1973; Seliger & Long, 1983; Wong Fillmore, Ammon, McLaughlin, & Ammon, 1985), very few studies have manipulated the environment in an attempt to promote second language acquisition.

Current research concerning successive L2 acquisition, the phenomenon whereby a child acquires a second language after having developed basic linguistic skills in the first, stresses that the grammatical knowledge that undergirds language ability and proficiency is acquired quite unconsciously. Learners have to acquire these all-important aspects of language almost entirely without formal instruction (Dulay & Burt, 1974a, 1974b; McLaughlin, 1984). Because language learners depend on speakers of the target language, research has become increasingly concerned with environmental factors that play an important role in L2 acquisition. Both the input children receive and the way in which children interact with the input are important determinants of L2 acquisition (Gass & Madden, 1985).

The learner is not a passive participant. He or she must be motivated to communicate in the target language (Gardner & Lambert, 1972). Motivation to learn the second language appears to be enhanced by decreasing the social distance between second language learners and members of the target language group (Schumann, 1976). In addition, children will be more motivated to communicate with speakers of the target language if they have a positive attitude toward these speakers (Gardner & Lambert, 1972).

Individual differences in children’s social skills also influence the rate of second language acquisition because discourse with native speakers helps children acquire a second language (Hatch & Long, 1980). Wong Fillmore (1976), in a study of five children learning English, observed that the children varied greatly in the way they approached the task of learning the second language and as a result achieved widely different levels of proficiency after the first year. The learners who were most successful initiated interactions with speakers of the target language and used whatever language they had acquired to maintain the conversation. They also counted on help from their friends who spoke the target language.

Thus, although children may use similar cognitive processes to acquire a second language, individual differences in motivation and social skills influence exposure to and interaction with speakers of the target language. Given that the most successful learners appear
to seek social interaction actively, research exploring these variables may be helpful in enhancing methods for promoting L2 acquisition in children.

One such variable is peer tutoring, which offers children acquiring a second language structured opportunities for successful initiation and meaningful interaction with native speakers. In a study by Johnson (1983), there was some evidence that a peer-tutoring intervention, in which Spanish-speaking, limited English proficient (LEP) elementary school children tutored fluent English-speaking (FES) children, promoted the English verbal interaction of the LEP students.

Strong (1983) also suggests that peer tutoring, when English learners have to explain in English something they know to an English speaker, may enhance language learning. His research shows that Spanish-speaking kindergartners characterized as talkative, verbally responsive, and gregarious in their first language more quickly acquired native English communicative language. Because contact with English-speaking children does not automatically improve English skills, he hypothesizes that the interaction alone is not enough but that children must make “active” use of the input. Strong therefore suggests that teachers do not simply “throw children together” but that they create situations in which children will want and need to communicate with each other to achieve a common goal.

A recent study by Wong Fillmore et al. (1985) supports the validity of peer tutoring as an intervention to promote L2 acquisition. One major conclusion was that third- and fifth-grade Hispanic LEP students profited from opportunities to interact with peers who spoke the target language. The more opportunities they had to use English with peers, the more they gained in English production and comprehension.

METHOD

This study consisted of two experiments. Limited English-speaking (LES) Mexican American children were the subjects of investigation in the first experiment, and limited Spanish-speaking (LSS) Mexican American children were the subjects of investigation in the second experiment. Experiment 1 examined the effects of a peer-tutoring treatment designed to encourage interaction in English between LES Mexican American children, who were the tutors, and FES children. Experiment 2 examined the effects of the
same treatment in Spanish, which was designed to encourage interaction in Spanish between LSS Mexican American children, who were the tutors, and fluent Spanish-speaking (FSS) children. In addition, both experiments investigated the relationship between gains in the amount of interaction in the target language and gains in language proficiency in English (Experiment 1) and Spanish (Experiment 2); the relationship between the amount of interaction in the target language and language proficiency in that language; and the relationship between the treatment and language proficiency in the target language.

Subjects

Participants were 26 Mexican American children, 13 boys and 13 girls, who ranged in age from 6 to 10 years. The 12 subjects in Experiment 1 were limited English-speaking, fluent Spanish-speaking children, hereafter referred to as LES. The 14 subjects in Experiment 2 were limited or non-Spanish-speaking, fluent English-speaking children, hereafter referred to as LSS.

The 12 LES children in Experiment 1 were selected from 80 children in an early childhood education program according to the following criteria: (a) Spanish was their dominant home language, and (b) they were the most limited in English language proficiency in the program. The 14 LSS subjects in Experiment 2 were selected according to the following criteria (a) The adults in the family were monolingual English speakers or bilingual English-Spanish speakers, and (b) the children were the most limited Spanish-speaking Mexican American children in the program.

Home language was determined by both the California State Home Language Survey, conducted by the school district, and the investigator’s familiarity with the children’s families. The children were designated as LES (Experiment 1) or LSS (Experiment 2) on the basis of the James Language Dominance Test (James, 1974) and the investigator’s observations over time of the children in the classroom. Language Assessment Scales (DeAvila & Duncan, 1977) scores used to match subjects before assignment to treatment and control groups verified the accuracy of these designations.

Setting

Participants attended an early childhood education program, Grades K-4, in an elementary school district serving a multiethnic,
lower and lower middle-income population. At the time of the study, there were seven learning centers in the early childhood education program: visual motor, language, reading, mathematics, cognitive strategies, independent work, and computer. Since the program was based on a strong belief in individualization, each of the 80 children had an individualized program. They moved from center to center each half hour, in groups of approximately 20 children. LES children were integrated into the program, except during the language period. For this period, they were grouped together and provided with ESL instruction, rather than the language arts instruction the native English-speaking children received.

The program staff consisted of 6 head teachers and 15 instructional aides. Each teacher was responsible for at least one center. Since all children in the program rotated through all the centers, treatment-group and control-group children received the same type of general instruction.

Overview of Design

This quasi-longitudinal study, which employed a matched-pairs experimental design for the two experiments, was carried out over a time period of 6 months. A timeline for these events is presented in Figure 1 (Experiment 1) and Figure 2 (Experiment 2). Prior to each treatment, LES children in Experiment 1 and LSS children in Experiment 2 were observed during their free time for 2 weeks to determine the amount of their interaction with peers in the target language. They were given two language proficiency tests in English in Experiment 1 and in Spanish in Experiment 2—the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1965) and the Language Assessment Scales (LAS)—and a nonverbal intelligence test—the Coloured Progressive Matrices test (Raven, 1963).

Children were matched on language proficiency test scores and proportion of interactions with peers in the target language. Members of each pair were then randomly assigned to treatment and control groups. The peer-tutoring treatment, which continued for 6 weeks, consisted of sessions designed to provide a structured setting for natural language practice between the tutor, who was a child acquiring a second language, and a tutee, a child fluent in the target language. During their free time, all children were observed in order to assess ongoing treatment effects.

Posttreatment observations, made during free time, continued for 3 weeks. Children were also observed for 10 minutes in a setting
FIGURE 1
Timeline for Testing, Observations, and Treatment in Experiment 1

<table>
<thead>
<tr>
<th>Time period in weeks</th>
<th>Testing</th>
<th>Observational samples</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tr>
<tr>
<td>1</td>
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<td>Four 5-minute periods</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intelligence testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Six 2½-minute periods</td>
<td>Treatment/ control</td>
</tr>
<tr>
<td>4</td>
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<td>Treatment/ control</td>
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<tr>
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<td>Treatment/ control</td>
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<tr>
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<td>Treatment/ control</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>Treatment/ control</td>
</tr>
<tr>
<td>Posttreatment—</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>immediate</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
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<td>10-minute structured observation</td>
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<td>Language proficiency testing</td>
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</table>
structured by the investigator. They were posttested on the same language proficiency measures. Thirteen weeks after the treatment, children from Experiment 1 were also observed a second time during 2 weeks and were posttested a second time at the end of this observation period.

FIGURE 2
Timeline for Testing, Observations, and Treatment in Experiment 2

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<th>Observational samples</th>
<th>Intervention</th>
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<td>Treatment/ control</td>
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</table>

Procedures

Observations. To determine the quantity and nature of verbal interaction between subjects and their peers, a language use observation instrument was developed. The instrument allowed for
recording (a) number of utterances, defined as a sentence or complete thought or message; (b) language of the utterance (Spanish, English, or code-switching within the utterance); and (c) school status and language of the person the child was addressing (English-speaking, Spanish-speaking, or bilingual; student or teacher).

LES children in Experiment 1 and LSS children in Experiment 2 were the subjects of observation. Children were observed in a random order, alternating between treatment and control subjects. Each child was observed for 5 minutes at a time, except while treatment was in progress, when children were observed for 2½ minutes at a time. As soon as all treatment-group and control-group children had been observed once, the observation cycle was repeated. The amount of time between observations for each individual was determined by the amount of time it took to observe all experimental children once.

Observations were collected when children were in free play. This was possible during two 10-minute morning recesses and a half-hour lunch recess. While the treatment was in progress, observations were collected only during the morning recesses, since children in the treatment group were tutoring during lunch recess.

Because friendship patterns established before the treatment began were strong and may have been the most powerful influence on interaction patterns, it was decided to assess the children’s language use during sessions structured by the investigator. The groups into which a subject was placed were formed by randomly choosing two bilingual children and two FES children from the children in the early childhood education program. Each group of 5 children was told that it had a certain amount of time (10 minutes in Experiment 1 and 5 minutes in Experiment 2) to work together to make a block structure. (It was found in Experiment 1 that one 10-minute observation was too long.) Instructions were given to the children in both English and Spanish so language use would not be biased by the instructions.

Two observers coded the frequency of children’s utterances with peers while they were in free play during the morning and lunch recesses. They simultaneously coded 76 occasions, consisting of 12 subjects rated four times each in Experiment 1 and 14 subjects rated twice each in Experiment 2. (Only two of the three periods were used for purposes of interrater reliability.) The Pearson correlation coefficient was .99.

Testing. To measure language proficiency in English in Experiment 1 and in Spanish in Experiment 2, subjects were pre- and posttested
on the first 70 items of the PPVT and three subtests of the LAS. The first LAS subtest measures productive vocabulary and consists of 20 items. The subject must provide the correct word for each picture shown. The second, consisting of 10 items, measures comprehension of syntax and vocabulary. The subject listens to a tape-recorded sentence and chooses the correct picture from a plate of three pictures. The third subtest measures the child’s ability to retell a story after listening to a short tape-recording of it.

Scores consisting of number of correct responses were used for the first two subtests. The story-retell task was rated on a 0-10 scale. To ensure high interrater reliability, two raters, both fluent in English and Spanish and familiar with the LAS, scored the story-retell section. The raters’ scores never differed by more than a half point. When they differed, raters’ scores were averaged. The Coloured Progressive Matrices test was given to ensure that large differences in ability did not account for the treatment effect.

Treatment. The treatment in Experiment 1 consisted of peer-tutoring sessions in which the tutor was the LES child and the tutee was a non-Spanish-speaking, FES child whom the LES child had selected from among the 80 children in the early childhood education program.

For half an hour during their regular ESL class, an instructional aide taught the children in the treatment group how to play a game or perform an enjoyable activity (e.g., baking a cookie, making a kite, conducting a simple science experiment) in English. The children learned the new vocabulary and commands necessary to carry out the activity. The emphasis was on as much verbal practice associated with the activity as possible. While the children were carrying out each step, they repeated what they were doing, both as a group and individually.

After the language arts class, each tutor chose an FES child from the early childhood education program. For a half hour during lunch recess, the LES child and his or her partner came to the language arts center, where the LES child taught the game or activity to the chosen partner (for more information, see August, 1982).

The LES tutors were given the opportunity to choose their own partners in order to help them initiate interactions in English. This was an important aspect of the treatment. Initiating interaction with a FES child is often a prerequisite for gaining access to English language input. Many of the LES children were reticent to approach FES, non-Spanish-speaking children, and this limited the English language input to which they were exposed. It was unusual
for a FES, non-Spanish-speaking child to approach a LES child. It was hoped that by practicing to initiate interaction, it would be easier for the LES child to initiate interactions after the treatment.

The FES tutees were also given instructions to make them better partners. They were asked not to respond until their tutor had given them verbal instructions and to accept a gesture only if their tutors could not explain the procedure in English. They helped their tutor by asking simple yes-no questions in English to elicit the information they needed to proceed. Finally, they talked about what they were doing in order to provide more input for their tutors and to increase interaction.

The children in the control group received their customary ESL instruction. This was small-group, direct instruction using a highly structured, grammer-based approach called the DISTAR Oral Language Program (Engelmann & Osborn, 1974). This program teaches oral language related to actions and the description of objects, as well as the language necessary to understand classroom instruction. Children are expected to model the teacher exactly and are reinforced for doing so. Inattention, nonresponding, and mistakes are corrected immediately. During lunch recess, children in the control group were free to interact with whomever they wanted on the playground.

The treatment in Experiment 2 consisted of the same peer-tutoring intervention; however, the tutor was a LSS or non-Spanish-speaking, Mexican American child. Tutoring was conducted as much as possible in Spanish, since the goal was Spanish language acquisition for LSS children. The children in the control group received Spanish language instruction using the DISTAR Oral Language Program in Spanish (Robinson, 1981).

ANALYSIS AND RESULTS

Experiment 1

In Experiment 1, the first hypothesis investigated was that the LES children who participated in the peer-tutoring treatment as tutors would interact in English with FES peers outside of the treatment intervention more than would LES children in the control group.

For each LES subject for each time period, two statistics were calculated: (a) the mean number of utterances in English to peers for the observation segments in each time period (see Table 1), and (b) the proportion of English to peers, calculated as the ratio of utterances in English to peers to the total number of utterances to peers (see Table 2). The time periods were prior to treatment,
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<th>MPS</th>
<th>Dur 2 MFE</th>
<th>MPS</th>
<th>Dur t MFE</th>
<th>MPS</th>
<th>Pst 11 MFE</th>
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Note: Pre = prior to treatment; Dur 1 = first three observations during treatment; Dur 2 = second three observations during treatment; Dur t = all six observations during treatment; Pst 11 = first three observations following treatment; Pst 12 = second three observations following treatment; Pst 1t = all six observations following treatment; Pst 2 = three observations 13 weeks later; Pst t = all nine observations following treatment; MFE = mean frequency of utterances in English to peers; MPS = mean frequency of utterances in Spanish to peers; M = missing data.

* Membership in treatment group.
### TABLE 2
Proportion of English to Peers’

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<tr>
<th>Student</th>
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<th>Dur t</th>
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<td>0.24</td>
<td>0.22</td>
<td>0.23</td>
<td>0.31</td>
<td>0.26</td>
</tr>
<tr>
<td>9(^b)</td>
<td>0</td>
<td>0.67</td>
<td>0</td>
<td>0.50</td>
<td>0.67</td>
<td>0</td>
<td>0.25</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.03</td>
<td>0.09</td>
<td>0.06</td>
<td>0.17</td>
<td>0.13</td>
</tr>
<tr>
<td>11(^b)</td>
<td>0.51</td>
<td>0.59</td>
<td>1.00</td>
<td>0.73</td>
<td>0.40</td>
<td>0.74</td>
<td>0.66</td>
<td>0.81</td>
<td>0.74</td>
</tr>
<tr>
<td>12</td>
<td>0.48</td>
<td>0.93</td>
<td>0.69</td>
<td>0.77</td>
<td>0.56</td>
<td>1.00</td>
<td>0.88</td>
<td>1.00</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Note: Pre = prior to treatment; Dur 1 = first three observations during treatment; Dur 2 = second three observations during treatment; Dur t = all six observations during treatment; Pst 11 = first three observations following treatment; Pst 12 = second three observations following treatment; Pst 1t = all six observations following treatment; Pst 2 = three observations 13 weeks later; Pst t = all nine observations following treatment.

\(^a\) Proportion = \(\frac{\text{Total number of utterances in English to peers in each observation period}}{\text{Total number of utterances to peers in each observation period}}\)

\(^b\) Membership in treatment group.
during treatment, immediately following treatment, 13 weeks after the treatment occurred, and all posttreatment observations combined (see Figure 1).

The Wilcoxon matched-pairs signed-ranks test was used to compare treatment and control groups on these statistics. No significant differences were found between treatment and control groups for any time period (see Table 3). Since only 6 pairs of subjects were involved in the first experiment, there was little chance of obtaining a statistically significant treatment effect. All 6 treatment-group children would have had to exceed their control-group partner on the dependent measures for the test to be statistically significant in their favor.

TABLE 3
Wilcoxon Matched-Pairs Signed-Ranks Test Statistics

<table>
<thead>
<tr>
<th>Time periods</th>
<th>Mean frequency English</th>
<th>Mean frequency Spanish</th>
<th>Proportion English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to treatment</td>
<td>$z = -0.944$</td>
<td>$z = -0.314$</td>
<td>$z = -1.214$</td>
</tr>
<tr>
<td></td>
<td>$p = .345$</td>
<td>$p = .753$</td>
<td>$p = .225$</td>
</tr>
<tr>
<td>During treatment</td>
<td>$z = -0.105$</td>
<td>$z = -0.524$</td>
<td>$z = -0.105$</td>
</tr>
<tr>
<td></td>
<td>$p = .917$</td>
<td>$p = .600$</td>
<td>$p = .917$</td>
</tr>
<tr>
<td>Immediately following</td>
<td>$z = -0.314$</td>
<td>$z = -0.135$</td>
<td>$z = -0.524$</td>
</tr>
<tr>
<td>treatment</td>
<td>$p = .753$</td>
<td>$p = .593$</td>
<td>$p = .600$</td>
</tr>
<tr>
<td>13 weeks following</td>
<td>$z = -0.314$</td>
<td>$z = -1.572$</td>
<td>$z = -0.524$</td>
</tr>
<tr>
<td>treatment</td>
<td>$p = .753$</td>
<td>$p = .116$</td>
<td>$p = .600$</td>
</tr>
<tr>
<td>All posttreatment</td>
<td>$z = -0.105$</td>
<td>$z = -0.943$</td>
<td>$z = -0.105$</td>
</tr>
<tr>
<td>observations</td>
<td>$p = .917$</td>
<td>$p = .345$</td>
<td>$p = .917$</td>
</tr>
</tbody>
</table>

For this reason, descriptive analyses were used to supplement the Wilcoxon matched-pairs signed-ranks test. For each time period, a median for the treatment group and a median for the control group was calculated on the basis of the scores on mean frequency of English to peers for each subject. Prior to the intervention, the treatment group was speaking slightly more English to peers than the control group (a median of 4.6 treatment compared with 1.4 control mean utterances in English). The observations collected immediately after intervention indicated the two groups were comparable (11.5 treatment, 11.7 control). Thirteen weeks after the intervention, however, the median of mean frequency of utterances in English to peers was substantially higher for the treatment than for the control group (21.8 treatment, 12.8 control). Because it was not possible to make a totally satisfactory matching of subjects on
English interactions with peers, there were initial differences in English interaction which favored the treatment group by a mean of 3.2 utterances. However, 13 weeks after the intervention, treatment-group subjects outstripped control-group subjects by 9 mean utterances in English, an indication that they were speaking substantially more English to peers.

For the 10-minute, structured observation, linguistic interaction between the LES child and the other 4 randomly selected children in the group was described by (a) the frequency of utterances in English to peers and (b) the proportion of English to peers relative to total utterances. The Wilcoxon matched-pairs signed-ranks test was used to compare experimental and control groups. Only the difference between the two groups on frequency of utterances in English to peers was significant, with the differences favoring the treatment group, $z = -2.0023, p < .05$.

In summary, the free-play observation data indicate no significant statistical differences between treatment-group and control-group subjects. However, medians for mean frequency of English interaction with peers 13 weeks following the intervention showed the treatment subjects were interacting in English almost twice as much as the control subjects. Observational data collected while the subjects were in a structured setting corroborate this hypothesis: There were significant differences between treatment-group and control-group subjects in the frequency of utterances in English to peers.

The second hypothesis investigated whether subjects who gained the most in interaction in English also made the greatest gains in language proficiency. Since the lexical and comprehension subtests of the LAS did not measure gains in language proficiency for the more proficient children who scored at or close to ceiling on the pretests, many of the difference scores were zero or close to zero. Thus, the language proficiency measures used in the experiments were not sensitive enough to reflect differences.

The third hypothesis stated there would be a significant relationship between interaction with peers fluent in the target language and language proficiency in the target language. Immediately following the treatment, there were significant correlations between mean frequency of utterances in English to peers and posttest measures of comprehension on the LAS comprehension subtest and receptive vocabulary measured by the PPVT (see Table 4). The same relationship existed between proportion of English to peers and language proficiency test scores. A similar pattern appears in the data collected 13 weeks after the intervention. Correlations between the proportion of English to
peers in a structured setting and all language proficiency test scores were also significant. Thus, this hypothesis was partially supported by significant positive correlations.

In addition, the effectiveness of the peer-tutoring intervention as an ESL technique was examined. Treatment and control groups were compared on their growth in language proficiency over the course of the experiment as measured by difference scores on the PPVT. A mean of the treatment group’s difference scores (scores immediately following treatment minus pretreatment scores; scores 13 weeks after treatment minus pretreatment scores) was compared with a mean of the control group’s difference scores. There was growth on the part of both treatment and control groups. Immediately following the treatment, the control group had gained an average of 4.3 points out of 40 total points, and the treatment group 3.5 points. By the second posttest, the treatment group had gained an average of 7.8 points, and the control group 4.8 points. Although there were no statistically significant differences between groups, $t (12) = -.36, p = .84$, the treatment group achieved almost twice as much growth as the control group.

### EFFECTS OF PEER TUTORING

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### TABLE 4
Correlations Between the Amount of English to Peers and Language Proficiency Test Scores

<table>
<thead>
<tr>
<th>Observations</th>
<th>Language proficiency test scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAS lex</td>
</tr>
<tr>
<td>Mean frequency of</td>
<td></td>
</tr>
<tr>
<td>English to peers</td>
<td>.24</td>
</tr>
<tr>
<td>Proportion of English</td>
<td>.16</td>
</tr>
<tr>
<td>to peers</td>
<td></td>
</tr>
<tr>
<td>Structured setting</td>
<td></td>
</tr>
<tr>
<td>Proportion of English</td>
<td>.80**</td>
</tr>
<tr>
<td>to peers</td>
<td></td>
</tr>
<tr>
<td>Mean frequency of</td>
<td>.16</td>
</tr>
<tr>
<td>English to peers</td>
<td></td>
</tr>
<tr>
<td>Proportion of English</td>
<td>.28</td>
</tr>
<tr>
<td>to peers</td>
<td></td>
</tr>
</tbody>
</table>

Note: Posttreatment 1 = observations immediately following treatment; Posttreatment 2 = observations 13 weeks following treatment; LAS lex = Language Assessment Scale lexical subtest; LAS comp = LAS comprehension subtest; LAS prod = LAS production subtest; PPVT = Peabody Picture Vocabulary Test.

* $p < .05$.  ** $p < .01$. 
Experiment 2

In Experiment 2, the first hypothesis investigated was that LSS children who participated in a peer-tutoring intervention as tutors where communication was in Spanish would interact more in Spanish with FSS peers than would the LSS children in the control group. The Wilcoxon matched-pairs signed-ranks test was used to compare treatment and control groups on mean frequency of utterances in Spanish to peers and proportion of Spanish to peers before the treatment began, during the treatment, and immediately following the treatment. There were no statistically significant differences between treatment and control groups on any statistic at any time period.

Descriptive statistics were used to supplement the results of the Wilcoxon test. To examine trends in interaction, a median for the treatment group and a median for the control group were calculated on mean frequency of Spanish to peers. The results indicate that children in both treatment and control groups decreased in mean frequency of utterances in Spanish to peers (treatment group –2.50, control group –.32). For both groups there was almost no Spanish spoken to peers, compared with English.

As in Experiment 1, children were also observed during two 5-minute observation periods structured by the experimenter. Most notable is that treatment- and control-group children spoke a great deal of English and almost no Spanish. The Wilcoxon matched-pairs signed-ranks test was used to compare treatment and control groups on mean frequency of utterances in Spanish to peers and proportion of Spanish to peers. There were no significant differences between the two groups (mean frequency of Spanish to peers: z = –0.0, p = 1.0; proportion of Spanish to peers: z = –0.267, p = 0.789).

The observations of linguistic interaction in both free play and a structured situation do not support the hypothesis that the peer-tutoring intervention would increase the amount of Spanish spoken to peers significantly more than the control intervention, the DISTAR Oral Language Program. In fact, the results demonstrated that with either intervention, it was difficult to increase the amount of Spanish that LSS Mexican American children spoke to their peers. Even those children who at the beginning of the experiment were bilingual enough to communicate easily in Spanish did not increase their interaction in Spanish with peers.

The second hypothesis investigated whether children who gained most in interaction in Spanish also made the greatest gains in language proficiency. There was very little interaction in Spanish with peers and thus no individual differences in the frequency and proportion of Spanish spoken to peers. In addition, on the LAS
comprehension test, 8 children began at or within 1 point of the ceiling. For these reasons, no correlational analysis was undertaken.

The third hypothesis, concerning the relationship between amount of interaction in Spanish and Spanish language proficiency, was not investigated because of the almost total absence of Spanish spoken to peers.

The fourth hypothesis concerned the relationship between peer tutoring and Spanish acquisition. Of all the tests used, the PPVT best measured growth in language proficiency because none of the children started out scoring close to ceiling. The test also had enough items to measure growth in language proficiency. On the PPVT, 12 children in treatment and control groups increased in score, 1 remained the same, and only 1 decreased.

**DISCUSSION**

Experiment 1 showed significant differences between subjects in the treatment and control groups in frequency of English to peers in the structured setting, with the treatment group speaking more English. However, differences between treatment and control groups were not evidenced when the children were observed in free play. It is possible that the strong friendship patterns formed prior to treatment prevented any change of interactions in unstructured settings.

A comparison of treatment and control medians of mean frequency of English to peers in free play indicates that immediately following the intervention, subjects in the treatment group were speaking the same amount of English to peers as those in the control group. However, 13 weeks after the intervention, the treatment group was speaking substantially more English to peers than the control group. One possible explanation for the marked difference between treatment and control groups after 13 weeks is that receptivity of FES children to interaction with Spanish-dominant children may have increased as a result of Experiment 2, which focused on Spanish language acquisition and thus increased the status of the Spanish-dominant children.

The inability to investigate the second hypothesis points up the difficulty of finding tests that are sensitive measures of English language acquisition. The language proficiency tests used in these experiments did not differentiate enough among learners to allow testing of this hypothesis. Future investigations should use tests that are sensitive enough to make it possible to correlate language proficiency with data on linguistic interactions. In addition, the
language tests used were not sensitive to the kind of language that children might acquire through communication in a natural setting. An important contribution to more efficient research in L2 acquisition would be the development of an adequate measure of communicative competence that can be used with children in the primary grades.

In regard to the third hypothesis, correlations were significant between frequency and proportion of English to peers in free play and receptive language and between proportion of English in a structured setting and all measures of language proficiency. Either the children who had more proficiency in English interacted more in English, or the more children interacted in English with peers, the better was their English proficiency. The present study cannot furnish any information concerning causal direction.

Although there were no statistically significant differences between the two groups in gains in English language proficiency (Hypothesis 4), 13 weeks following the intervention the treatment group had made almost twice as much growth as the control group on the PPVT. The growth seems to attest to the effectiveness of the peer-tutoring technique for language learning because the DISTAR Oral Language Program used in the control group constitutes an intervention of proven effectiveness (Abt Associates, 1977).

The results from Experiment 2 demonstrate how difficult it is to increase the amount of Spanish that LSS Mexican American children speak to their Spanish-speaking peers. The peer-tutoring treatment helped to increase the children’s Spanish language proficiency or to prevent it from decreasing. The intervention, however, was not strong enough to change the language-interaction patterns of the children. Some of the children in the treatment group were still too limited in Spanish language proficiency to communicate easily in Spanish, and since they could communicate with most of the other students in English, they chose to do so. The children who were fluent enough in Spanish to communicate easily with bilingual or LES, FSS peers in Spanish chose to continue to speak mostly English.

Previous interaction patterns may have influenced the treatment group in favor of English. In addition, English had much more status in the early childhood education program. All teachers, with the exception of one, spoke only English, and language dominance of the teacher has an inevitable impact on the language environment and language use in the class (Ramírez, 1980).
In the community where this investigation took place, the political and economic situation has made English the higher status language. Schumann and Stenson (1975) point out that marked differences in the political and economic power of language groups tend to interfere with language acquisition. Edelsky and Hudelson (1980) found that in an alternate-day bilingual program in the primary grades, both Anglo and Chicano non-Spanish-speaking children failed to acquire Spanish, a failure which they attributed to the inferior status of the second language in the institution where acquisition was to take place.

These findings suggest that peer tutoring may be an effective means of encouraging interaction between Mexican American children acquiring English and their FES peers. This may in turn enhance English language proficiency. The findings also indicate that peer tutoring may be a promising ESL technique. However, the study points out the difficulty of helping LSS children acquire Spanish in an environment where English is the language with considerably more status.

THE AUTHOR

Diane L. August, PhD, is the Director of the Education Division at the Children’s Defense Fund, a privately supported organization that works on a broad range of public policy issues essential to enhancing the well-being of poor children and their families.

REFERENCES


The Impact of Interaction on Comprehension

TERESA PICA, RICHARD YOUNG, and CATHERINE DOUGHTY
University of Pennsylvania

The study reported in this article compared the comprehension of 16 nonnative speakers (NNSs) of English on directions to a task presented by a native speaker (NS) under two input conditions: premodified input, in the form of a NS baseline lecturette modified by decreased complexity and increased quantity and redundancy, and interactionally modified input, consisting of the NS baseline lecturette without linguistic premodification, but with opportunities for interaction with the NS. It was found that comprehension was best assisted when the content of the directions was repeated and rephrased in interaction; however, reduction in linguistic complexity in the premodified input was not a significant factor in NNSs' comprehension. It was also found that NS-NNS interfactional modifications in the form of comprehension and confirmation checks and clarification requests served as a mechanism for NS modification of input, either by encoding or, more frequently, by triggering repetition and rephrasing of input content, and thus played a critical role in comprehension. Results of the study support current theoretical claims regarding the role played by interfactional modifications in facilitating second language comprehension. These results also provide guidelines for restructuring interaction in the classroom to serve learners' needs for comprehensible input.

In recent years, much second language research has been directed toward the study of input comprehension. This has been motivated by the belief that the learner's exposure to a target language is not in itself a sufficient condition for second language acquisition. From Corder's (1967) early claims to Krashen's (1985) current Input Hypothesis, there has been a widespread conviction that input must be comprehended by the learner if it is to assist the acquisition process.

Current second language acquisition research has tried to identify what it is that makes input comprehensible to the learner. Blau (1980), Chaudron (1983, 1985), P. Johnson (1981), Krashen (1980,
1982, 1983, 1985), and Long (1985) have considered this question from a theoretical and empirical point of view. We, too, have attempted to answer this question through a study of input comprehension in two different kinds of linguistic environment available to second language learners.

The first kind of linguistic environment is characterized by input that has been modified, or simplified, in some way before the learner sees or hears it, for example, through repetition and paraphrase of words, phrases, or sentences; restriction of vocabulary to common or familiar items; addition of boundary markers and sentence connectors; and reduction in sentence length and complexity through removal of subordinate clauses. Figure 1 provides examples of input that was modified according to a number of these characteristics for the purposes of the present study. The availability of modified input to second language learners has been established through studies of speech used by native speakers (NSs) to nonnative speakers (NNSs) —the so-called foreigner-talk studies (see Hatch, 1983, and Long, 1980, 1981, for reviews of this research). Modified input is also available within the

FIGURE 1
Examples of Modification of Selected Linguistic Features in Input Directions for the Assembly Task

<table>
<thead>
<tr>
<th>Complexity: Reduction in the number of S-nodes per T-unit per direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: [In the center of the crossroads, [right where the three meet,] put the dog in the—in the carriage.] (2 S-nodes per T-unit)</td>
</tr>
<tr>
<td>Modified: [Put the dog in the middle of the three roads.] (1 S-node per T-unit)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity: Increase in the number of words per direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Moving to the top right corner, place the two mushrooms with the three yellow dots in that grass patch, down toward the road. (23 words)</td>
</tr>
<tr>
<td>Modified: Move to the top right corner. Take the two mushrooms with the three yellow dots. Put the two mushrooms on the grass. Put the two mushrooms on the grass near the road. (32 words)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Redundancy: Increase in repetition of content words per direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exact or partial:</td>
</tr>
<tr>
<td>Baseline: Place the two mushrooms with the three yellow dots in that grass patch, down toward the road. (no repetition)</td>
</tr>
<tr>
<td>Modified: Take the two mushrooms with the three yellow dots. Put the two mushrooms on the grass. Put the two mushrooms on the grass near the road. (3 repetitions)</td>
</tr>
<tr>
<td>Semantic or paraphrase:</td>
</tr>
<tr>
<td>Baseline: Place the one piece with the two trees right at the edge of the water. (no repetition)</td>
</tr>
<tr>
<td>Modified: Put the two trees at the top of the water. Put the two trees above the water. (1 repetition)</td>
</tr>
</tbody>
</table>
classroom, through techniques for simplifying spoken and written language in textbooks, reading passages, and tape recordings (see Honeyfield, 1977, and Phillips & Shettleworth, 1976, for critical perspectives on classroom input modification).

The second kind of environment for second language acquisition is characterized by opportunities for NS-NNS interaction in which both parties modify and restructure the interaction to arrive at mutual understanding. Until recently, this environment has been found mostly outside of instructional contexts, and it is especially absent in classrooms in which teachers control topic initiation and the elicitation of content and restrict students to the passive role of respondent. However, this kind of environment is becoming increasingly available within the classroom through more interactive procedures for managing classroom learning, such as conversation games, role plays, and student group and pair tasks (see, e.g., Brumfit & K. Johnson, 1979; K. Johnson & Morrow, 1981).

Modifications of the interfactional structure of conversations are most frequently brought about through moves first identified by Hatch (1978a, 1978b) and Long (1980, 1981, 1983). These moves, examples of which appear in Figure 2, include clarification requests and confirmation checks, by which one interlocutor seeks assistance in understanding or confirming the other’s preceding utterance, and comprehension checks, through which one interlocutor seeks the other’s acknowledgment that a preceding message has been understood.

PURPOSE OF THE RESEARCH

The purpose of the study reported in this article was to compare the effects of these two environments for acquisition on NNSs’ comprehension of input. The first environment was modeled by experimental Condition 1, in which input provided to the NNSs was modified a priori and no opportunities were allowed for interaction with the NS who provided the input. The second environment was modeled by Condition 2, in which input was not premodified linguistically but the NNSs were allowed opportunities to interact with the NS who provided the input. The NNSs could thus seek help with input they could not understand.

In focusing the study on a comparison of input and comprehension under these two conditions, we were developing a line of research which has already established that input modifications similar to those in Condition 1 promote comprehension. The studies by Blau (1980), Chaudron (1983, 1985), P. Johnson (1981), and Long (1985) noted above have shown that NNS comprehension is
**FIGURE 2**
Examples of Interactional Modifications in NS-NNS Conversations

<table>
<thead>
<tr>
<th>NS</th>
<th>NNS</th>
</tr>
</thead>
</table>
| And right on the roof of the truck, place the duck. The duck. | I to take it? *Dog*
| Duck. | Duck. |
| It’s yellow and it’s a small animal. It has two feet. | *I put where it* |
| You take the duck and put it on top of the truck. *Do you see the duck?* | *Duck*
| Yeah. Quack, quack, quack. That one. The one that makes that sound. | Ah yes. I see in the—in the head of him. |
| OK. *See* | *Put what* |
| OK. Put him on top of the truck. | *Truck*
| The bus. Where the boy is. | Ah yes. |

* Confirmation checks: Moves by which one speaker seeks confirmation of the other’s preceding utterance through repetition, with rising intonation, of what was perceived to be all or part of the preceding utterance.

* Clarification requests: Moves by which one speaker seeks assistance in understanding the other speaker’s preceding utterance through questions (including *where*, polar, disjunctive, uninflected with rising intonation, or tag), statements such as *I don’t understand*, or imperatives such as *Please repeat*.

* Comprehension checks: Moves by which one speaker attempts to determine whether the other speaker has understood a preceding message.

...significantly better when the input is in the form of an a priori linguistically modified text or lecturette than when the input is presented in its original, unmodified form. What we predicted, however, was that the level of comprehension would be even greater when subjects were given opportunities to interact with the NS who provided the input.

This prediction was based on a current theory regarding the role of interaction in second language acquisition put forward by Hatch (1978a, 1978b, 1983) and Long (1980, 1981, 1983, 1985). What Hatch and Long have proposed is that in the course of interaction, learners and their interlocutors negotiate the meaning of messages by modifying and restructuring their interaction in order to reach mutual understanding. As a result of this negotiation, learners come to comprehend words and grammatical structures beyond their current level of competence and ultimately incorporate them in their own production. Thus, if comprehension of input is a necessary condition for successful second language acquisition, then
interaction, or as Long has claimed more specifically, interactional modification, is the mechanism that brings about that comprehension.

Examples of how this input might occur can be seen in the interactions shown in Figure 2, in which the NNSs' requests for clarification and confirmation of the input they have received from the NS bring about a restructuring of the interaction and modifications of the input until understanding appears to be achieved. Since the claims regarding the importance of such restructuring of interaction had never been tested directly, the present study sought to measure what effects, if any, these modifications of interaction have on comprehension. We believed the study was, therefore, the first empirical test of the claim that interactional modifications lead to comprehension of input.

RESEARCH DESIGN

The Task

The study required a task which, first, would be a good measure of comprehension and, second, would provide an appropriate context for interaction. For this second reason, conventional paper-and-pencil tests of listening comprehension were rejected, and a format similar to the communication games now available for ESL teaching was adopted (see K. Johnson & Morrow, 1981).

The task required NNSs to listen to a NS give directions for choosing and placing 15 items on a small board illustrated with an outdoor scene. Individual items were two-dimensional cutouts representing a variety of plant, animal, and human figures, each of which shared at least one feature, such as shape, color, or size, with one other item. The board itself was illustrated with scenery, including figures similar to those on the cutouts, as well as landmarks such as a pond, patches of grass, a skyline, roads, vehicles, and other objects.

Each direction given by the NS included a description of the item and references to the place on the board where it was to be positioned. Comprehension was measured by the number of items which the subject selected and placed correctly. One point was given for correct selection of the item and one point for correct placement. The interactions were either video- or audiotaped, and transcriptions were made from the recordings.

Two versions of the directions to the task were developed—a baseline, or linguistically unmodified, version and a linguistically modified version. The baseline version of the directions was
compiled from a recording of NS-to-NS interaction on the task. The linguistically modified version of the directions was developed by taking the baseline version and simplifying it according to the criteria reviewed in Figure 1. This technique ensured that both sets of directions—the baseline and the linguistically modified versions—had similar content but differed only in the quantity, redundancy, and complexity of the language used. Table 1 provides a quantitative comparison of the linguistic features in the baseline and linguistically modified versions of the script used by the NS as input for all 15 directions.

TABLE 1
Comparisons of Mean Quantity, Redundancy, and Complexity in Baseline, Premodified, and Interactionality Modified Input

<table>
<thead>
<tr>
<th>Input</th>
<th>Quantity</th>
<th>Redundancy</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>16.47</td>
<td>0.20</td>
<td>1.20</td>
</tr>
<tr>
<td>Condition 1: premodeled</td>
<td>33.47</td>
<td>7.20</td>
<td>1.02</td>
</tr>
<tr>
<td>Condition 2: interactionally modified</td>
<td>51.64</td>
<td>13.17</td>
<td>1.23</td>
</tr>
<tr>
<td>Difference between Conditions 1 &amp; 2</td>
<td>18.17</td>
<td>5.97</td>
<td>0.81*</td>
</tr>
<tr>
<td>t</td>
<td>2.37*</td>
<td>2.90*</td>
<td>1.91</td>
</tr>
</tbody>
</table>

Note: All figures for Condition 2 include baseline input. Quantity = words per subject per direction; redundancy = repetition of content words per subject per direction; complexity = S-nodes/T-unit per subject per direction.

* Direction of difference is opposite to that predicted.

Through a rigorous program of pretesting, the task was established as a reliable measure of listening comprehension: First, 30 linguistically modified directions to the task were tested on 10 NSs, who demonstrated 100% accuracy on all items. The same directions to the task were then tested on 25 NNSs drawn from the population of subjects who were to participate in the actual study. Item analyses were carried out, and 15 directions with a point biserial correlation of .20 or higher were selected for use under the experimental conditions of the study. Analysis of results from the directions used in the research produced a Kuder-Richardson 21 reliability coefficient of .76 for the task as a whole and a point biserial correlation coefficient of .30 or above for 13 out of the 15
directions chosen, indicating that the task was a reliable and accurate test of listening comprehension.

Subjects

Sixteen NNSs were selected from volunteers enrolled in preacademic, communicatively oriented, low-intermediate ESL classes. All subjects were adults and were about equally divided between European and Asian first language backgrounds. Although they had engaged in group and pair work in their classes, none of the subjects had had any previous experience of the task used in the study. Half of the subjects were assigned randomly to one of the experimental conditions, and the other half to the other experimental condition.

Data Collection

Under Condition 1, premodified input, 8 subjects heard the linguistically adjusted script read by a female NS, who was experienced in speaking with foreigners but not in ESL teaching. Subjects participated on a one-to-one basis with the NS, who read each direction only once and then paused, giving the NNS subject as much time as necessary to place the object on the board. Other than NS checks to see whether the next direction could be read, there was no interaction between the NS and the subject.

Under Condition 2, interactionally modified input, the same NS initially read each direction from the baseline input script. Subjects also participated on a one-to-one basis with the NS. Here, however, the 8 subjects were encouraged to seek verbal assistance from the NS if they had any difficulty in following the directions. No limit was placed on the amount of interaction that could take place. The NS also checked on whether the directions were understood or needed repeating. As in Condition 1, subjects were given as much time as necessary to place the object on the board. Unlike Condition 1, linguistic modifications were not built into the directions for Condition 2. Instead, it was hypothesized that such modifications would be produced by the NS as a result of interaction with the NNSs in Condition 2.

To ensure that comprehension of the task would be based on spoken input and interaction alone, a screen was placed between the subject and the NS in both conditions, so that the NS could neither see nor physically participate in the selection and placement of items. (However, the NS and the subject could see each other’s faces.)
Hypotheses

Two major hypotheses were formulated to answer the research question, Do interfactional modifications make input comprehensible? First, based on current claims from second language acquisition theory, it was predicted that the same kinds of linguistic adjustments that had been built into the modified input in Condition 1 would arise spontaneously during the interaction in Condition 2. Three experimental hypotheses were formulated based on this prediction:

1. Quantitatively more input would be available in the interactionally modified directions of Condition 2 than would be available in the premodified directions of Condition 1, as measured by the mean number of words per direction.
2. The input available in Condition 2 would be more redundant than that in Condition 1; that is, it would contain more repetitions of words naming items to be selected and places to put them in carrying out directions to the task.
3. The input available in Condition 2 would be less complex, that is, contain fewer S-nodes per T-unit, than that in Condition 1.

The second major hypothesis of the study was that the subjects in Condition 2 would show greater comprehension of the directions than would the subjects in Condition 1. On the basis of this prediction three additional experimental hypotheses were formulated:

4. The mean score for selecting the correct item on the task would be higher for subjects in Condition 2 than for those in Condition 1.
5. The mean score for placing the item in the correct position on the board would also be higher for subjects in Condition 2 than for those in Condition 1.
6. The mean total score for selection and placement on the task would be higher for subjects in Condition 2 than for those in Condition 1.

RESULTS AND DISCUSSION

The Two Major Hypotheses

Results obtained in testing the first major hypothesis of the study are shown in Table 1. In terms of quantity of input, there were twice as many words per direction in Condition 1 (33.47) as a result of our own a priori modifications to the baseline data (16.47). However, approximately 18 additional words per direction were counted in
the interactionally modified input in Condition 2, thus making a total of almost 52 words per subject per direction as a result of interaction. (All figures for Condition 2 in Table 1 include baseline input; thus, the quantity of input of 51.64 = the baseline of 16.47 + 35.17 additional words.)

The redundancy measure showed an even greater difference among the three kinds of input. Compared with hardly any repetitions in the baseline data, the premodified input in Condition 1 contained an average of 7 repetitions of content words per direction. However, there were 6 more repetitions of content words as a result of interaction in Condition 2, making a total of just over 13 per subject per direction. On t tests these quantity and redundancy differences were found to be significant, well below the alpha level of .05.

Finally, we found that our own premodifications of the baseline input led to a reduction in mean complexity to just over one S-node per T-unit. However, the prediction that interaction would also lead to less complexity was not supported. Instead, interaction brought about a net increase in complexity over both baseline and premodified input.

The second major hypothesis of the study was strongly supported by our results. As shown in Table 2, scores for selection, placement, and overall comprehension were significantly higher for Condition 2 subjects than they were for subjects in Condition 1, leading to the conclusion that interfactional modifications of input did, in fact, lead to significantly greater comprehension than conventional ways of simplifying input, through a priori manipulations of text.

TABLE 2
Comparison of Mean Comprehension Scores of Subjects in the Two Experimental Conditions

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Mean selection score</th>
<th>Mean placement score</th>
<th>Mean combined score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 1: premodified</td>
<td>83% (12.38)</td>
<td>55% (8.25)</td>
<td>66% (20.63)</td>
</tr>
<tr>
<td>Condition 2: interactionally modified</td>
<td>95% (14.25)</td>
<td>81% (12.13)</td>
<td>88% (26.38)</td>
</tr>
<tr>
<td>Difference between Conditions 1 &amp; 2</td>
<td>12% (1.87)</td>
<td>20% (3.88)</td>
<td>19% (5.75)</td>
</tr>
<tr>
<td>* t</td>
<td>3.37*</td>
<td>2.79*</td>
<td>3.78*</td>
</tr>
</tbody>
</table>

* Null hypothesis rejected; α = .05.
The Effect of Interaction on Comprehension for Individual Directions

Results of the present study provided empirical evidence for the value of NS-NNS interaction in the negotiation of message meaning and for the important role which such negotiations play in input comprehension. Given these results, however, it was important to pinpoint more specifically exactly how comprehension was assisted through interaction. To do this, a more detailed analysis of results on individual directions was undertaken.

First, the effect of interaction on comprehension for each direction was measured by the difference between the mean score on that direction for the group receiving interactionally modified input and the corresponding score of the group receiving premodified input. It was found that of the 13 directions with positive point biserial correlation coefficients, 5 showed a high positive effect for interaction in assisting comprehension, whereas 3 showed a negligible or even negative effect for interaction.

As shown in Table 3, on Directions 15, 8, 11, 1, and 5, subjects in Condition 2 performed one and a half to three times as well as those in Condition 1. Mean scores on 4 out of 5 of these directions for

<table>
<thead>
<tr>
<th>Direction</th>
<th>Condition 1 mean score (%)</th>
<th>Condition 2 mean score (%)</th>
<th>Condition 2 – Condition 1 difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>71</td>
<td>86</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>36</td>
<td>81</td>
<td>45</td>
</tr>
<tr>
<td>11</td>
<td>91</td>
<td>94</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>100</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>88</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>88</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>56</td>
<td>75</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>81</td>
<td>94</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>81</td>
<td>94</td>
<td>13</td>
</tr>
<tr>
<td>12</td>
<td>69</td>
<td>81</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>88</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>94</td>
<td>94</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>94</td>
<td>88</td>
<td>– 6</td>
</tr>
<tr>
<td>10</td>
<td>94</td>
<td>81</td>
<td>–13</td>
</tr>
</tbody>
</table>

All directions: 69 88 19

Note: Directions 10 and 12 have negative point biserial correlations with the test as a whole and hence cannot be counted on to give reliable information about comprehension.
subjects in Condition 2 matched or exceeded their overall mean score of 88% for all 15 directions. However, for subjects in Condition 1, scores on 4 out of these 5 directions were well below their overall mean of 69% for the 15 directions. In fact, three of the scores—on Directions 15, 8, 11—were the lowest of any under either of the experimental conditions studied. Apparently, these 5 directions were so difficult to understand that premodified input alone was not sufficient for comprehension. Instead, opportunities for interaction with the NS direction-giver played an important role in achieving comprehension.

In contrast to this result, on three directions the subjects who received interactionally modified input performed the same as or even, in one case, slightly worse than the subjects who heard premodified input without interaction. Accuracy scores on Directions 6, 13, and 3 were quite high for both groups: close to the mean overall score of 88% for subjects who had opportunities for interaction and well above the mean score of 69% for subjects who heard premodified input only. These results indicate that both groups found the input in Directions 6, 13, and 3 sufficiently easy to understand, whether it was presented in an a priori modified form or as unmodified input but with opportunities for interaction. Based on examination of these results, it seems reasonable to conclude that modifications of interaction were most effective in achieving comprehension when the nonnative speaker had difficulty in understanding the input, but interfacational modifications were superfluous when the input was easily understood.

Comparison of Input in Directions

This result was then explored further in terms of the categories of input modification established for the purposes of the study, that is, quantity, redundancy, and complexity. Tables 4-6 provide comparisons of the input available in those directions for which interaction made a difference in NNSs’ comprehension and the input available in those directions for which interaction made no difference. Examination of the directions with the most positive effect for interaction indicated that with respect to complexity, there was hardly any difference in the input that either group received (see Table 4).

However, as shown in Tables 5 and 6, considerable differences were found with respect to quantity and redundancy. Tables 5 and 6 compare, respectively, the mean number of words and mean number of repetitions in the directions for which interaction led to improved comprehension (15, 8, 11, 1, and 5) and in those directions

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TABLE 4
Comparison of Complexity of NS Input for Directions 15, 8, 11, 1, 5 vs. Directions 6, 13, 3

<table>
<thead>
<tr>
<th>Input</th>
<th>Directions 15, 8, 11, 1, 5</th>
<th>Directions 6, 13, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Condition 1</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>Condition 2</td>
<td>1.18</td>
<td>0.06</td>
</tr>
<tr>
<td>Difference (2 - 1)</td>
<td>0.18</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Note: Complexity was measured by the ratio of S-nodes to T-units.

For which it had no effect (6, 13, and 3). Each subject’s scores for each set of directions (15, 8, 11, 1, 5 and 6, 13, 3) were averaged. The means of all subjects in Condition 1 were then totaled, as were those of subjects in Condition 2. Line 3 of each table displays the difference between the two group means, and line 4 provides a breakdown of this difference on a per subject basis.

On those directions for which interaction led to improved comprehension, there was a large difference in the amount of input given to each group (see Table 5). However, on those directions for which interaction did not have an impact on comprehension, there was a much smaller difference between the amounts of input that both groups received. To be specific, about 40 more words per subject were used on each direction in which the interactional condition brought about better comprehension than the premodified input condition. On the other hand, when interaction did not make much difference in each group’s comprehension, there was an

TABLE 5
Comparison of Quantity of NS Input for Directions 15, 8, 11, 1, 5 vs. Directions 6, 13, 3

<table>
<thead>
<tr>
<th>Input</th>
<th>Directions 15, 8, 11, 1, 5</th>
<th>Directions 6, 15, 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Condition 1</td>
<td>279.80</td>
<td>59.20</td>
</tr>
<tr>
<td>Condition 2</td>
<td>598.80</td>
<td>159.00</td>
</tr>
<tr>
<td>Difference (2 - 1)</td>
<td>319.00</td>
<td>91.70</td>
</tr>
<tr>
<td>Difference per subject</td>
<td>39.87</td>
<td>11.48</td>
</tr>
</tbody>
</table>

Note: Quantity was measured by the total number of words per direction.
average of 11 more words per subject per direction. These latter
directions were apparently easy for both groups and therefore did
not require prolonged interaction with the NS for their understand-
ing. For directions that were not easy to understand, however,
opportunities for NNSs to receive more input on selection and
placement of items in the task were crucial for successful
comprehension.

On closer examination of the data, it was found that this increase
in the number of words appeared to be due to repetitions of content
words, that is, lexical items naming pictures to be selected and
places to put them in carrying out directions to the task. On those
directions for which interaction facilitated comprehension, and
which consequently required more input, there was an average
increase of about 7 repetitions per subject per direction in
Condition 2 over Condition 1 (see Table 6). However, on those
directions for which interaction did not have an effect on
comprehension, there were actually fewer repetitions in the
interaction group—an average of 2 fewer per subject per direction
in the interactional input in comparison with the premodified input.
We inferred from this analysis that for Directions 6, 13, and 3, the
baseline input required little repetition to be understood, but when
the baseline input could not be understood, as in Directions 15, 8,
11, 1, and 5, an increase in the quantity of input due to repetitions
was of considerable assistance.

### TABLE 6
Comparison of Redundancy of NS Input
for Directions 15, 8, 11, 1, 5 vs. Deletions 6, 13, 3

<table>
<thead>
<tr>
<th>Input</th>
<th>Directions 15, 8, 11, 1, 5</th>
<th>Directions 6, 13, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Condition 1</td>
<td>62.40</td>
<td>21.74</td>
</tr>
<tr>
<td>Condition 2</td>
<td>115.00</td>
<td>46.85</td>
</tr>
<tr>
<td>Difference (2 – 1)</td>
<td>52.60</td>
<td>–17.63</td>
</tr>
<tr>
<td>Difference per subject</td>
<td>6.58</td>
<td>– 2.20</td>
</tr>
</tbody>
</table>

Note: Redundancy was measured by the total number of repetitions of content words per direction.

Taken together, these results reveal that comprehension of
difficult directions was assisted by an increase in the amount of
input brought about by repetitions of content words relevant to
selection and placement of task items. However, a decrease in the
complexity of the input did not appear to be a critical factor in comprehension. Indeed, as has been shown over all directions, interaction resulted in input that was more complex than input that was modified according to conventional criteria of linguistic simplification.

This result is especially important because most current methods of simplifying input, especially readability formulas and structural grading applied to written ESL materials, concentrate on facilitating comprehension by shortening sentences and removing embedded clauses. This procedure, while intuitively appealing, since it corresponds to conventional ideas of foreigner talk, may actually impede rather than aid understanding. Reducing the number of words may eliminate redundancy, whereas removal of embedded clauses may serve no useful purpose at all.

The Role of Interfunctional Adjustments in Assisting Comprehension

One final examination was conducted on the interfunctional modifications used in those directions that showed the most positive effects for interaction. Table 7 indicates that there were more interfunctional adjustments in those directions for which interaction made a difference in comprehension, but the wide variation in the numbers of these adjustments in Directions 6, 13, and 3 made us reluctant to conclude that this difference was a significant one.

<table>
<thead>
<tr>
<th>Interfunctional modification</th>
<th>Directions 15, 8, 11, 1, 5</th>
<th>Directions 6, 13, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>49.00</td>
<td>33.00</td>
</tr>
<tr>
<td>SD</td>
<td>6.13</td>
<td>22.13</td>
</tr>
<tr>
<td>Mean per subject</td>
<td>6.13</td>
<td>4.13</td>
</tr>
</tbody>
</table>

Note: Interfunctional modifications were measured by the total number of clarification requests, confirmation checks, and comprehension checks.

However, in light of theoretical claims made by Long (1980, 1981, 1983, 1985) that it is not interaction per se that aids comprehension, but rather modifications to the structure of the interaction by moves to check or to seek help with comprehension, the interfunctional data were examined more closely in an effort to pinpoint the role the
interactional modification moves played in assisting comprehension. In this regard, it was believed that these moves may have been the mechanism that triggered the increase in repetitions and hence overall quantity of input, which helped subjects to comprehend the more difficult directions.

As shown in Figure 3, a total of 575 repetitions of content words were found in the NS input on those directions for which interaction proved to be critical to comprehension. Of these repetitions, 81, or 14%, were encoded either within the NS’s checks on the NNS’s comprehension or within her follow-up responses to comprehension checks brought about by requests for help by the NNS. Again, a further 50% of the repetitions of content words were triggered by interactional moves on the part of the NNS. Exactly half, or 289, of the repetitions were made in direct response to NNS requests for clarification or confirmation.

FIGURE 3
Repetitions in Directions 15, 8, 11, 1, 5

There were also a number of instances in the data in which a comprehension check on the part of the NS was followed by a
clarification request by the NNS. Similarly, appeals by the NNS that were followed by a confirmation check or clarification request from the NS were also found. The data include 50 repetitions produced under these circumstances, accounting for 9% of the total. In these cases, it was often difficult to pinpoint exactly which move—the initial or the immediately preceding one—was more directly responsible for the following repetition. We therefore want to emphasize that although our analysis showed that 50% of the modification moves that triggered a repetition appeared to be initiated by the NNS and only 14% of these moves were initiated by the NS, this proportion is far from rigid.

Naturally, when seeking help with directions on the task, the NNSs frequently repeated content words, but these were not included in our tally of repetitions, since we were interested only in the input from the NS. We were not sure of the exact role that NNS repetitions played in the process of comprehension. However, their frequent presence in NNS interfactional modification moves suggests that they may have served as yet another signal for the NS to repeat words and thus, indirectly, may have acted as aids to the comprehension of the directions to our task.

Altogether, a total of 420, or 73%, of all repetitions in the interactions on Directions 15, 8, 11, 1, and 5 were triggered by interfactional modification moves initiated either by the NS or by the NNS, leaving only 27% that were apparently not triggered by some sort of interfactional modification move. It thus seems likely that the positive effect for the interactions that occurred on these directions was due primarily to the large number of repetitions that the input in those interactions contained.

Although Figure 3 separates the analysis of interfactional modification moves into those initiated by the NS versus those initiated by the NNS, it is important to bear in mind that neither participant was acting in isolation. It was difficult to determine who (or what) actually initiated the interfactional modification move itself. Since participants could see each other’s faces, it is possible that the NS was motivated to check the NNS’s comprehension because of looks of confusion or frustration on the subject’s face or because of other nonlinguistic behaviors of which we have no trace in our recordings.

It is also possible that the relatively long periods of time that the NS allowed the subjects in the interfactional condition for selection and placement of task items gave those subjects more time to process the input and seek to clarify or confirm its meaning. The question of time leads us to speculate whether comprehension is an instantaneous phenomenon or whether it is built up slowly over a
series of input segments. What we saw on the videotapes was a hand moving to select or place an item, and this movement itself may have reflected a build up of comprehension over time rather than instantaneous comprehension followed by an action based on that comprehension.

Apart from these reservations about our findings, we feel that we have enough evidence to infer that interfactional modifications do in fact serve as an important stimulus or vehicle for the repetition of input, which our own study and many studies before us (e.g., Chaudron, 1983; Long, 1985) have shown to be crucial to comprehension.

CONCLUSIONS

Results of our research, we feel, are important in three ways. First, they provide additional support to research that has focused on identifying which features make input comprehensible to second language acquirers. To restate our results, redundancy in input was found to be an important factor in comprehension, whereas grammatical complexity of the input seemed to make little difference. The quantity of the input also appeared to be important, but primarily as a vehicle for redundancy.

Second, these results provide empirical support for what, up to now, have been only theoretical claims about the importance of interfactional modifications in aiding comprehension of input. Interaction had a facilitating effect overall on comprehension, but when interaction had the greatest effect, this appeared to be accomplished through interfactional modifications in the form of confirmation and comprehension checks and clarification requests that brought about the greater number of repetitions necessary for comprehension.

Finally, our results have implications for classroom teaching. Our own previous research (Doughty & Pica, 1986; Pica & Doughty, 1985a, 1985b, in press), as well as that of Long and Sato (1983) and Pica and Long (1986), has revealed that very few moves to modify interaction for the purpose of achieving comprehension occur in the classroom, even in those classrooms considered to be highly communicatively oriented or those geared toward the promotion of skills and strategies for comprehension. Our current findings suggest that it is possible for teachers to assist understanding of input through adjustments in quantity and redundancy of teacher talk, made without requests for clarification or confirmation from their students, and that with certain kinds of input, these
adjustments may be sufficient for learners’ comprehension. However, our research results also indicate that an increase in the redundancy of teacher talk is not, of itself, enough to ensure comprehension; rather, teachers should check on how well their students have understood and should constantly encourage them to initiate requests for clarification of meaning or to check with the teacher that they have understood correctly.

Facilitating input comprehension in classroom settings thus requires a teacher-student relationship and patterns of classroom interaction that are radically different from the pattern of teacher elicitation, student response, and teacher feedback that classroom research has identified as typical of teacher and student discourse (Mehan, 1979; Sinclair & Coulthard, 1975). Facilitating input comprehension in the classroom requires elicitation from teachers that seek to check on learners’ understanding and not merely on the form of their spoken production. It also requires contributions from learners that are geared toward understanding input and not simply toward providing formally correct speech.

Our findings also suggest that if classroom input is to become optimally comprehensible, it should no longer be the teacher’s sole prerogative to ask questions; the scope and purpose of questions should extend beyond mere student display and teacher evaluation. All participants in classroom interaction should ask questions, and those questions should serve to clarify and confirm input, thereby making it comprehensible.

This study helps to define which approaches to language instruction provide an environment that is rich in potentially comprehensible input. Other things being equal, those classrooms that encourage spoken interaction among participants, so that both teachers and students feel confident to initiate discussion of unclear points, will help to make input comprehensible. However, it should be noted that there are other ways of making input comprehensible that do not involve spoken interaction, such as consulting a dictionary, reviewing material as homework, or consulting with classmates or the teacher outside of class time. Further research is needed before the relative merits of these different means of obtaining comprehensible input can be compared.

We cannot conclude, moreover, that this study endorses any particular teaching method, since in-class oral interaction is a part of most instructional practices. However, in the absence of spoken interaction or of other ways of making input comprehensible, the present study indicates that premodification of input by the teacher and curriculum designers in the form of carefully graded syllabuses and simplified reading texts and tape recordings is of limited utility.
Instead, results of the study suggest that if oral interaction between students and teacher is encouraged, even ungraded syllabuses and materials may provide input that will become comprehensible. Perhaps the most significant pedagogical implication to be drawn is that any teacher or method that facilitates a realignment of the traditional roles of teacher and student, so that students can take greater initiative or assume more responsibility for their own learning, is likely to encourage in-class oral interaction, which in turn can increase comprehension of input.

In light of these implications for classroom instruction, however, we have a number of practical concerns about teacher-student interaction and interfactional modification. We are worried about those students whose styles of classroom participation make them reluctant to question their teacher, to speak out voluntarily, or to respond to general classroom solicitations. Here, we are thinking of those Asian students, identified by Sato (1982), who were far less interactive than their Hispanic peers during teacher-fronted classroom interaction. Certainly the findings of Allwright (1980) and Day (1984) suggest that voluntary participation is not necessarily a key variable in successful classroom second language acquisition, and student self-reports gathered by Politzer and McGroarty (1985) have shown that good language learner behaviors of this kind, again, do not always correlate with factors of second language proficiency.

Because of these concerns, we are presently engaged in further research that, we hope, will begin to shed light on our questions and that will provide more details on the interfactional processes that have been shown to play such an important role in comprehension. Right now, the importance of interfactional modifications in facilitating the comprehension of input enjoys strong theoretical support. This is a theory that makes a good deal of sense to us. We hope that through our study of input, interaction, and comprehension, we have provided the theory with a long-overdue empirical base.

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REFERENCES


The *TESOL Quarterly* welcomes evaluative reviews of publications of relevance to TESOL professionals. In addition to textbooks and reference materials, these include computer and video software, testing instruments, and other forms of nonprint materials.

**Edited by POLLY ULICHNY**

*University of Massachusetts at Boston*

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**Speaking Relating and Learning: A Study of Hawaiian Children at Home and at School**


*Speaking, Relating and Learning* is a case study of the ways that part-Hawaiian children from lower income families speak at home and at school. The book addresses the hypothesis that school failure for these children is a product of cultural and linguistic discontinuities, a mismatch between patterns of speaking and interacting at home and those required in school.

The issue of the variable level of school success among minority children has been the subject of considerable discussion in a number of other recent studies. The view that failure is related to cultural and linguistic discontinuities has been criticized by Ogbu and Matute-Bianchi (1986), who claim that discontinuities in language and culture between home and school provide insight into the *how* of school failure, but not the *why*. They point instead to the importance of broader historical and sociocultural forces, in particular, to the perceived link between school success and later economic success, as determinants of why children from one ethnic group succeed in school whereas others do not—regardless of the degree of mismatch between their own and the majority’s language and culture. But Ogbu and Matute-Bianchi’s argument leaves the individual teacher in an uncomfortable and rather hopeless position, since no solution appears possible, short of the total overthrow of the current socioeconomic system.

Boggs’s study of Hawaiian children at home and at school, however, examines one pedagogical solution that in actual implementation has had quite extraordinary results, the Kamehameha
Early Education Program (KEEP). His book is an attempt to show that these achievements are a product of a congruence between patterns of interactions already familiar to part-Hawaiian children and those employed by teachers in the KEEP classroom.

Boggs begins with a brief description of traditional Hawaiian family relationships in an effort to assess to what extent traditional values and speech ways have been maintained in part-Hawaiian families today. He finds that a strict hierarchy of family relationships is of central importance in both traditional families and in those in his study. Parents, of course, occupy the highest status positions, whereas children are part of an age-graded hierarchy, according to which the eldest child becomes the parent’s “lieutenant,” enforcing parental orders and overseeing younger children. The allocation of chores both expresses and reinforces this hierarchy, and children are thus eager to accept their chores and even those of an elder sibling in an effort to claim higher status.

As in many other Oceanic and Southeast Asian societies, very young children in these families are indulged and shown unrestrained affection. Significantly, however, parents commonly begin to ignore and sometimes even to punish the demands and requests of children after they reach the age of 3 or 4, expecting them to begin to conform to norms of respect for those of higher status and authority. Not surprisingly, children learn not to ask, but to observe, suggest, and insert themselves unobtrusively and at opportune moments.

In chapters 3 and 4 evidence of the verbal behavior of parents and children is presented to demonstrate how the hierarchy develops and is maintained within the family and is played out within the peer group. Boggs links the strict sibling hierarchy within the family to the frequent quarreling of young part-Hawaiians with their peers. He sees this “endemic quarreling” as a result of a hypersensitivity to assertiveness that develops out of sibling relationships. By mid-adolescence most children are able to control their anger in disputes with peers by joking and other means. Unfortunately, at the point that children first enter school, they have not yet learned how to deal with their hypersensitivity to assertiveness, and disputes are commonplace and disruptive in the classroom.

In chapter 5, “The Rhetoric of Authority,” Boggs focuses on the parents’ unrestricted and largely asymmetric right to question children and the critical role that questions play in punishment routines. Part-Hawaiian children are typically questioned by their parents in order to extract incriminating evidence from them. Children understandably try to avoid direct questioning by adults
or answer only briefly. This pattern conflicts with the teacher’s use of direct questions in recitation because children respond in a similar manner, with avoidance or silence. This is clearly one among a number of cultural and linguistic discontinuities that exist for these children.

Chapters 6 and 7 examine two forms of speech in more detail: contradicting and talk story. Disputes often take the form of the contradicting routine, which has elements in common with teasing routines used by parents with their children. But because young children lack the power to transform disputing into play in their peer interactions, contradicting for them is the “rhetoric of conflict.” Talk story, by contrast, is the “rhetoric of solidarity” and includes all kinds of verbal play, teasing/joking, jingles, riddles, and story telling, constructed and executed cooperatively. Boggs hypothesizes that learning to talk story may facilitate peer interactions. When they enter school, however, young children have not yet developed much skill in talk story. And although adults seem to play an important role in its elicitation, apparently parents rarely try to elicit talk story. In this sense part-Hawaiian parents are like Athabaskan parents, who do not encourage their children to perform for them as Anglo middle-class parents commonly do (Scollon & Scollon, 1981).

By the time the author turns to examine these children in typical classroom interactions (chapter 9), we are hardly surprised at his report. Discipline is a major problem, with children constantly quarreling among themselves and with misunderstandings—both of the teacher’s directives and of attempts to keep order—being commonplace. Although children apparently like to talk to the teacher, they refuse to answer or only give perfunctory answers to direct questioning. Hence, children do poorly in recitation that requires an individual answer to a direct question from the teacher.

Decontextualized information and instructions also consistently miss their mark. Teachers’ attempts to get the children to pay attention to them on command before an activity is under way contrasts with the situation at home, where attention arises in the context of an ongoing activity (p. 129). On the other hand, patterns of communication and interaction that are meaningful to these children are underutilized, even negated. Their desire to initiate and complete tasks on their own, for example, is constantly frustrated by rigid classroom schedules and the teacher’s desire to be in command. This situation is in marked contrast to the KEEP classroom.
In the KEEP school, a research and demonstration school supported by a private estate, struggle for control of the classroom has lessened because its environment is organized to make greater use of patterns of behavior familiar to the children, patterns documented by Boggs in the preceding chapters. Children work in small groups at activity centers, and each has an individualized schedule of tasks for the day. The child’s desire to initiate and complete tasks on his or her own is thus integrated into the organization of the classroom. Although children continue to quarrel in their small groups, it is much more within the context of performing an activity and does not interfere with that activity to the degree that it does in the traditional classroom.

In a similar fashion, KEEP draws on Hawaiian talk story and its related verbal routines to teach children reading. Reading lessons are transformed into a joint performance, in which both teacher and students participate in retelling stories from books and from their own experience. The joint performance structure of both reading lessons and talk story enables children unaccustomed to decontextualization and a hierarchical recitation structure (which most middle-class children are quite comfortable with by school age) to learn how to read without first learning how to recite and without totally transforming the child’s own cultural background.

Boggs presents a convincing case for the congruence between KEEP methodologies and the patterns of speech and interaction common to children from lower income, part-Hawaiian families. His arguments could have been made somewhat more accessible to ESL and bilingual teachers if he had included in his account more comparative data to emphasize the distinctiveness of the children in his study in relation to middle-class, Anglo children. Furthermore, Boggs’s description of events often lacks the richness of contextual information that one might expect, given the amount of time he spent in his communities and classrooms. More and “thicker” description would have added depth and richness to his sometimes rather scant speech data.

These shortcomings, however, do not diminish the importance of the KEEP example. The success of KEEP supports the contention of Heath (1982) and others (Hymes, 1972; Ochs & Schieffelin, 1984) that language learning is cultural learning that varies from one sociocultural group to the next and that therefore there is no single developmental model of language learning all children follow nor one single method of teaching that will be effective with all children. It is hoped that Boggs’s work will alert others to the need for further research among Hawaiians and other ethnic minorities in
the search for more culturally sensitive and pedagogically effective teaching methods.

REFERENCES


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University of Massachusetts at Boston

REVIEW 763
Reviews of

ENGLISH LANGUAGE PROFICIENCY TESTS


Reviews of English Language Proficiency Tests provides descriptive and evaluative information on the major ESL/EFL tests being used in the world today. By providing this information in a consistent format, Reviews assists test users in selecting tests appropriate to their needs and in evaluating the quality of those tests.

A description of the test and a discussion of its reliability, validity, and related issues are contained in the review. Also included in each review are reference materials: references cited by the reviewer and, in many cases, references added by the editors to provide more comprehensive information on the test being reviewed.

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TEACHERS OF ENGLISH TO SPEAKERS OF OTHER LANGUAGES
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Paying Attention to Pronunciation: 
The Role of Self-monitoring in Perception

GEORGE YULE, PAUL HOFFMAN, and JACK DAMICO
Louisiana State University

It is widely recognized that a crucial component in developing effective second language pronunciation is, in fact, the development of particular listening skills. In many textbooks ostensibly dedicated to improving ESL pronunciation, a substantial number of exercises are devoted to making sure that the student, as listener, can first recognize the types of sound distinctions that are phonemic in English. As Prator and Robinett (1985) claim in the introduction to their pronunciation manual, the first step in learning to pronounce in a second language is “learning to hear and identify a sound or sound contrast when a native speaker produces it” (p. xvi).

To develop this perceptual ability, most pronunciation texts offer various types of phoneme discrimination exercises. The assumption is that the more often ESL learners can accurately identify the English sound contrasts presented, the more sensitive they will become to the basic elements in the English sound system. It should prove particularly disturbing, then, to ESL pronunciation teachers if, after a period of instruction employing such materials, a major proportion of their learners actually get worse, in terms of test scores, on a phoneme discrimination task.

In an earlier investigation (Yule, Damico, & Hoffman, in press), we attempted to account for this observed deterioration in accuracy over the short term by showing that better self-monitoring skills were being developed during the same period. Self-monitoring in this domain was defined as the ability to know when an accurate identification was being made and to recognize when a distinction was still not clear. We speculated, in that earlier study, that the learners involved would actually go on to improve their accuracy scores and would be making their identifications with much greater confidence as a result of their improved self-monitoring abilities.
In a subsequent study, with a different group of learners, we sought to confirm, first of all, that some ESL learners do in fact score lower on a phoneme discrimination task after several weeks of instruction. More important, we wished to discover if, at a later time, those same learners would go on to improve their accuracy level after developing better self-monitoring skills.

THE STUDY

A group of slightly more than 100 adult, intermediate-level ESL students enrolled in several sections of a pronunciation course using Prator and Robinett (1985) as the basic textbook volunteered to participate in the study. However, the results of this study are based on the performance of the 56 subjects from whom it was possible to collect data on three separate occasions.

The test materials consisted of a phoneme discrimination exercise accompanied by a confidence-rating scale. The students heard 40 tape-recorded sentences of the following type: (a) We saw a very big cloud, and (b) Just put that stuff in the back. They were asked to identify, on the answer sheet, one of the words in each sentence (crowd/cloud for Sentence a; back/bag for Sentence b). They were also asked to indicate, on an accompanying 5-point scale ranging from very sure (5 points) to not sure at all (1 point), how sure they were of the correctness of their choices. The students completed this exercise for the first time (T1) during the 1st week of their course, then during the 8th week (T2), and once again during the 15th week (T3). Exactly the same 40 test items were used, though they were randomly rearranged each time.

This kind of exercise yields two types of scores: (a) a percentage-correct (PC) score, which simply indicates how often the students made correct choices, and (b) an indication of self-monitoring ability, which is calculated on the basis of the responses to the confidence-rating scale. Very briefly, this self-monitoring score is calculated from the interaction of two sets of ratios. One dimension consists of the ratio of correct choices at Confidence Level 5 (then at 4, 3, 2, and 1) to total correct choices, and the other dimension is the ratio of incorrect choices at Level 5 (then at 4, 3, 2, and 1) to total incorrect choices. The ratios on correct choices can then be plotted as a function of ratios on incorrect choices to yield a curve. The area under this curve, within the unit square, provides a value up to a maximum of 1.00 that is sensitive to the individual’s use of the scale in interaction with correct and incorrect choices. The higher this value, the more often the student tends to be very sure when making correct identifications and less sure when possibly making incorrect identifications. Extended discussion and examples of this type of analysis can be found in Yule, Yanz, and Tsuda (1985).
RESULTS

Subjects were divided into three groups according to the change in PC score from T1 to T2. Group A (n = 23) consisted of those whose PC scores improved from T1 to T2; Group B (n = 29), those whose PC scores decreased from T1 to T2; and Group C (n = 4), those whose scores stayed the same. The scores of these three groups, both percentage correct and self-monitoring, are presented in Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>% Correct</th>
<th>Self-monitoring</th>
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<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
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<tr>
<td>A</td>
<td></td>
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<tr>
<td>M</td>
<td>65.43</td>
<td>74.13</td>
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<tr>
<td>SD</td>
<td>8.75</td>
<td>9.64</td>
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<tr>
<td>B</td>
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<tr>
<td>M</td>
<td>74.31</td>
<td>67.93</td>
</tr>
<tr>
<td>SD</td>
<td>9.30</td>
<td>10.31</td>
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<td>C</td>
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<tr>
<td>M</td>
<td>79.38</td>
<td>79.38</td>
</tr>
<tr>
<td>SD</td>
<td>8.26</td>
<td>8.26</td>
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</tbody>
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Mean differences for percentage correct and self-monitoring at different times were assessed by means of correlated-sample t tests. Group A showed a significant improvement in PC from T1 to T3, \( t(22) = 8.35 \), \( p < .001 \), and from T1 to T2, \( t(22) = 7.81 \), \( p < .001 \). The only significant change in self-monitoring came between T2 and T3, \( t(22) = 2.26 \), \( p < .05 \). Group B showed a significant decline in PC from T1 to T2, \( t(28) = 7.88 \), \( p < .001 \), and an equally significant increase from T2 to T3, \( t(28) = 5.31 \), \( p < .001 \). The only significant change in self-monitoring came as an increase from T1 to T2, \( t(28) = 3.43 \), \( p < .01 \). Group C showed no significant changes.

DISCUSSION

The results of this study confirm one finding of our earlier study (Yule, Damico, & Hoffman, in press): Group B, from T1 to T2, seemed to become worse at a task that had figured prominently in its first 7 weeks of instruction. Note, however, that during that same period this group’s self-monitoring level had significantly improved, and by T3, their PC scores had significantly improved over their T2 scores. Also worthy of mention is the fact that those in Group A, who had improved their scores significantly.
between T1 and T2, did not measurably change in PC between T2 and T3 but did develop improved self-monitoring skills during that same period. These findings demonstrate that the effect of standard pronunciation course materials may not simply be the development of an ability to “identify a sound or sound contrast” in the second language. We suggest that there is a complex interaction over time between simply identifying a sound contrast and being confident that the identification is accurate. Although the level of accuracy achieved by this group of learners only averaged about 75% by the end of their course of instruction, that accuracy seemed to have a more solid basis in terms of the learners’ self-monitoring skills. In other words, these learners had developed a keener sense of and greater confidence in knowing when they were getting a particular English sound distinction correct and when they were still likely to be making a mistake.

Extrapolating to a more general situation, we suspect that these learners would be in a much better position, when listening to a native speaker, to respond more quickly when they knew their identifications were secure and to ask for repetition, confirmation, or clarification when they knew their identifications were possibly inaccurate.

REFERENCES


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Comments on Leo A. W. van Lier’s Review of Techniques and Principles in Language Teaching

The Author Reacts. . .

DIANE LARSEN-FREEMAN
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I found Leo A.W. van Lier’s review of my book, *Techniques and Principles in Language Teaching*, which appeared in the March 1987 issue of the *TESOL Quarterly* (Vol. 21, No. 1), to be misguided. I wrote a book about eight language-teaching methods for teacher trainees and teachers who do not have a great deal of prior experience with the methods. Although van Lier acknowledges that the purpose of my book is to present practical information about the methods to teachers and that the book is not intended “to assess the relevance of current SLA [second language acquisition] theories” (p. 147), he takes me to task for not writing a book useful for classroom research and for not bridging the gap between SLA theory and classroom practice. In other words, I am criticized for not addressing an audience I never intended to address and for not writing a book I never intended to write. Before I consider van Lier’s comments in detail, however, I would like to provide a context for my remarks by briefly describing the format of my book.

In the book, I offer my readers a vicarious experience with eight language-teaching methods. For each method, we enter a classroom in which a particular method is being practiced. After we observe a lesson, our observations are listed. From each observation, a principle of the method is extracted. Following this is a Reviewing of the Principles section, in which the principles are reorganized as answers to 10 questions:
1. What are the goals of teachers who use the method?
2. What is the role of the teacher? What is the role of the students?
3. What are some characteristics of the teaching/learning process?
4. What is the nature of student-teacher interaction? What is the nature of student-student interaction?
5. How are the feelings of the students dealt with?
6. How is language viewed? How is culture viewed?
7. What areas of language are emphasized? What language skills are emphasized?
8. What is the role of the students’ native language?
9. How is evaluation accomplished?
10. How does the teacher respond to student errors?

The next section of the book summarizes and elaborates on the techniques commonly associated with each method. The chapter concludes with questions I pose to readers to encourage them to make a connection between what they understand about a method and their own situation. At the end of each chapter are some suggested activities and readings.

Now I would like to address the infelicities in the review as I perceive them. Van Lier’s central criticisms are that the sample lessons I use lack authenticity and variety and that my approach, first constructing and then analyzing a lesson to reveal the principles of a method, is circular. Van Lier’s specific claim is that “the fact that the lessons are not authentic but rather idealized and therefore hypothetical (however plausible) . . . seriously weakens their value in terms of classroom research and analysis” (p. 148). My first problem with this criticism is van Lier’s failure to report that the preface to the book clearly states that the lessons are idealized:

Each method is introduced in such a way as to afford the reader the opportunity to “observe” a class in which that method is being used. It must be acknowledged, however, that the class is always highly idealized. Anyone who is or has been a language teacher or language student will immediately recognize that language classes seldom go as smoothly as the ones we will see here. (In the real world students don’t always catch on as quickly and teachers don’t always perform so flawlessly.) (p. xii)

By failing to report this acknowledgment, van Lier leaves readers of the review with an impression that I was trying to pass off the lessons as being real.
Furthermore, in actual fact the sample lessons are based on “real” lessons. However, they differ from real lessons in two ways: They are not verbatim transcripts of entire lessons, and they are deliberately structured to reflect all the underlying principles of a method and how these principles commonly manifest themselves. My intent was for readers to become acquainted with the principles of each method and with the techniques commonly associated with each. I also wanted my readers to see that teachers using these methods have principled reasons for doing what they do in the classroom.

Van Lier talks about “the hypothetical nature of the data” (p. 148). To a classroom researcher like van Lier, the data might seem hypothetical. However, although I certainly subscribe to the value of teachers being trained as classroom researchers (see Long, 1983), that is not why I wrote this book. Furthermore, if I had included transcripts of actual lessons, the book would have become, at a conservative estimate, five times its actual size, as I am sure van Lier knows from transcribing classroom discourse. Moreover, if I had selected and quoted only certain exchanges in the lesson, then the lesson would have lost the overall coherence that I was striving to achieve.

Van Lier points out that I construct a lesson to illustrate the principles and then I use the lesson “as a basis for elucidating those principles” (p. 148). He calls this approach circular; I call it pedagogically appropriate. Following Freeman (1987), I have always relied on what I know works well in language teaching when I engage in teacher training. As a teacher, one of my jobs is to focus on what is relevant and to direct my students’ attention to what I am teaching. My approach would be circular if this were a book for classroom researchers. But it is not. It is a book to help readers increase their understanding of the principles and techniques of eight language-teaching methods. A major challenge in writing the book was to make difficult principles accessible. I believe this is more successfully accomplished when readers are focused on what is salient about a method and when they have an experience with it, albeit vicarious, rather than simply reading a description of it.

As to van Lier’s criticism that several of the sample lessons lack variety because they occur on the first day of an introductory course, such criticism is not new. Many others have questioned why methodologists have typically demonstrated their methods with lessons for beginners. I initially thought to illustrate the innovative methods through lessons aimed at learners at more advanced levels of proficiency just to obviate this frequent criticism; perhaps I should have. Anyone who has used the methods knows the
principles are applicable at higher levels of proficiency; they are even applicable to teacher training. The reason I made the decision I did, however, is presumably why others have done the same: The principles are much easier to discern at beginning levels. As I was writing a book for an audience whom I did not assume to have a great deal of experience with all the methods, I wanted to make the principles clear and accessible.

Incidentally, although van Lier is critical of the lack of variety in the level of the lessons, his summary table misrepresents what variety there is among the students in the various lessons. For example, van Lier categorizes fifth-grade Swedish students (aged 10) in one of the lessons as adults, and he categorizes Italian Scuola Media students in another lesson as teenagers, when in fact their age range is 11-13. Besides these inaccuracies, his choice of a binary classification (adults versus teenagers) conceals the variety of ages of the learners in the various lessons. My intention was to demonstrate that these methods are not age-bound, but rather can serve learners of varying ages. He also fails to say what the level of education of the learners was, for example, elementary, lower secondary, upper secondary, university, private language institute, adult education class. Thus, the table obscures the rich diversity of learner ages and educational levels that I deliberately incorporated.

Another of van Lier’s criticisms is that the 10 questions I pose for each method do not always reveal salient differences among the methods. By way of example he cites the fact that seven of the eight methods I introduce regard “communicating in the target language as central” (p. 150) in answer to the first question concerning a teacher’s goals. These are indeed the facts; however, the answers to the other 9 questions, which he has failed to report altogether, reveal profound differences among the methods. To summarize some of the answers to these questions:

Some methodologies see language acquisition as habit formation; others as rule formation.
Some focus on meaning in language; some on structures; others on the uses to which language is put.
Some teach culture with a capital C; some with a small c; others ignore it altogether.
Some see the use of the native language as important in making meaning clear; others strictly forbid its use in the classroom.
Some feel errors should be prevented at all costs; others feel that they are signs of a learner’s attempts to learn and should be corrected judiciously, if at all.
Some see language teaching as being completely in the control of the teacher; others are more learner centered.

I believe the examples above convincingly challenge van Lier’s claim that “some of the methods will be differentiated merely in terms of a few salient techniques or gimmicks, whether soft music, warm and reassuring teachers’ voices, colored rods, or implausible commands” (p. 150).

Van Lier uses the word rigid twice with regard to the common framework I have chosen to illustrate each method in the book. I wonder why he uses such a negative term, especially since in the same review he takes me to task for not listing the salient characteristics of each method “so that a direct and critical comparison would have been easier” (p. 151). I do not know what a framework is if it does not allow this. Is it possible to have a framework that is both “nonrigid” and that still allows for a direct comparison? I think not.

Van Lier cites as a problem in using this book the fact that it requires awareness training. Such comments have made Margaret van Naerssen (personal communication, June 3, 1987) wonder if van Lier has actually used the book in training or if his is just an “armchair review.” In another personal communication (August 3, 1987), van Naerssen states that she has used the book “a number of times in teacher training” and has “found the descriptions, the comparable framework, and the questions to be quite useful in developing awareness.” This is encouraging because developing awareness is exactly what I intended.

Awareness is the fulcrum in language teaching. What I want my readers to become aware of is that as teachers they always have decisions to make and that they should have some principled reasons for making the decisions they do. This is why everything the teachers do in the sample lessons is justifiable in terms of a methodological principle. The book, then, not only provides information on language teaching methods, but also works to increase readers’ awareness of the need to make decisions in a way consistent with their basic assumptions about teachers, learners, language, and the teaching/learning process. With this awareness, their growth/development as professionals is facilitated.

Since I see teacher education, a term I prefer to teacher training, as a developmental process, I do not concur with van Lier that a weakness of the book is that the questions posed at the end of each chapter are answerable on different levels. I think it is inevitable that the questions will be answered on different levels: Teachers will be at different stages of development with regard to being able to articulate their reasons for making the decisions they do.
Learning when, as a teacher, you have a decision to make, what the options are, why you make the decision you do, and what the consequences are of your decision are continuing challenges. Recognizing that such questions are fecund enough to be constantly plumbed at different depths means that teaching will never grow stale for me. Furthermore, I do believe that teachers are capable of coming to these awarenesses and that any program that asks otherwise of its participants is training them, not educating them (Larsen-Freeman, 1983c).

Van Lier’s next point is that the book fails to bridge the gap between theory and practice. I must object to this criticism on several grounds. First of all, a generally accepted definition of a theory is that it is a collection of coherent principles that are used to explain some phenomenon. With this definition in mind, I submit that my book is a consummate example of how a theory bridges to practice. Each method has a body of theoretical principles that we see manifested in classroom practice. The teachers do not make the decisions they do in a theoretical vacuum—they make decisions based on a set of theoretical principles.

Second, van Lier himself contends that my book was not intended to discuss the eight methodologies in light of SLA theory, so why does he intimate that my failure to do so is a weakness? SLA theory, at its current stage of development, has, in my opinion, very little to say about the theoretical principles advanced by methodologists. SLA researchers have been occupied with describing what they observe, with very few making causal claims that directly affect classroom practice. SLA research can increase our understanding of the SLA process and factors that affect second language learners, very important contributions; however, it cannot, at this point, prescribe classroom practice. Many research findings have not been verified or replicated empirically and those that have been are narrowly focused and are subject to differing interpretations.

This is not to say that methodologists can abdicate responsibility for their claims. As I have written elsewhere,

teaching methodologists have been rightfully criticized for being nonempirical, or at least not assessing themselves in understandable and comparative terms. Over the years, large-scale studies comparing methods have been notoriously unrevealing. It appears that when one deals with the comparison of methodologies, wholesale, the differences do not become apparent. Still, the issue of accountability, of having students reap the maximum benefit in the minimum time, is a test to which all methods should be subjected. (Larsen-Freeman, 1987, p. 68)
Nevertheless, in the absence of empirical validation by methodologists or SLA researchers, it seems to me that choosing/designing a method is more an art than a science (and perhaps will always remain so). Operating on this assumption, I have been deliberately circumspect in noting that I was not endorsing or rejecting any method in my book.

Toward the end of the review, van Lier shifts to what he terms the “believing game” (citing my previous work; see Larsen-Freeman, 1983c) and lists the virtues of my book, as he sees them. Even in this section, I take exception. I object to van Lier’s trivialization of the believing game. Believing in something does not mean merely suspending doubt. It means entering into the world of the author/researcher/methodologist and attempting to see the world as he or she sees it (Elbow, 1973).

Perhaps what is most disappointing, to me in the review is that even though I have been a leading proponent of the believing game when considering others’ work (Larsen-Freeman, 1983a, 1983b), my own work was not accorded the same treatment. As I have written before, playing both the doubting and believing games is necessary. One has to sift among the claims of others to see what rings true for oneself. But first, I believe, it is incumbent upon the reader to act responsibly and to understand the perspective of the contributor. One should not criticize until one truly understands what the other is about. One does not just impose one’s own agenda on the work of another; one tries to see the world through the latter’s lens. This is what I want my readers to do with the eight methodologies I have presented. This is what I wish van Lier would have done with my book.¹

REFERENCES


¹ I want to express my appreciation to Russell Campbell, Marianne Celce-Murcia and Donald Freeman for their comments on an earlier version of this response.
The Reviewer Responds... 

LEO A.W. van LIER  
Monterey Institute of International Studies

I personally regret that my review of Diane Larsen-Freeman’s book, *Techniques and Principles in Language Teaching*, has caused concern to the author. Professionally, however, I cannot justify changing anything I have said, barring one factual error, which I shall duly acknowledge. Personally, again, it troubles me to be accused of being misguided and unfair, but professionally I find nothing in the review to warrant such accusations.

When I was asked to review the book I happily accepted the task, since at first glance this was exactly the book I had been looking for in graduate training courses. On closer inspection, I felt increasingly disappointed and regarded it my duty as a reviewer to report my disappointment.

Every review is to some extent subjective and selective. Every book is, too. It is therefore unrealistic to expect objectivity. One can expect and demand fairness, but that is itself a subjective term. Let me therefore briefly address the points where Larsen-Freeman thinks I have been unfair or misguided.
1. Audience: I do not suggest that Larsen-Freeman fails to address an audience she does not intend to address, namely classroom researchers. What I suggest is that it is essential in teacher preparation to “promote the critical analysis of classroom data, coupled with . . . training in self-monitoring” (p. 152). It is ironic that I often, in class lectures, cite Larsen-Freeman’s work (e.g., 1983) as one of the best examples of such teacher development.

2. Authenticity of illustrated lessons: I find it highly unlikely that I leave any readers with the impression that Larsen-Freeman tries “to pass off the lessons as being real.” One can never entirely control readers’ interpretations, but how such a notion, implying willful deceit on the part of the author, can possibly occur to anyone reading my text is beyond me.

3. Circularity: This issue is the central reason for my disappointment with the book. I do not say this from the point of view of a classroom researcher, but as a teacher educator. The suggestion that my criticism is valid only if applied to classroom research, but not in pedagogical terms, can be dismissed on two grounds. In the first place, I clearly relate the problem to the “discussion of methodological principles in terms of actual classroom practices” (p. 148). Second, and this is more crucial, I do not regard classroom research as some theoretical activity that exists in isolation from teacher education or classroom practice. In my own work I continually stress the interrelatedness of classroom research and the teaching-learning process.

My point is, if we use classroom data, it is preferable that these data be authentic, both in research and in teacher education. Larsen-Freeman claims that in practical terms, the inclusion of authentic data would not have been feasible. I dispute that: A summary of one actual lesson may be as concise as a composite picture drawn from a number of lessons or from experience. Moreover, the idealized lessons do include direct speech by students and teachers. Surely, a summary of an actual lesson can include brief extracts of accurately transcribed interaction. In addition, the most useful work in a graduate practicum occurs when we get the student teachers to record, transcribe, and discuss (portions of) their own lessons. None of the activities in Larsen-Freeman’s book suggests such crucial work in consciousness-raising through self-monitoring. Larsen-Freeman says that a vicarious experience is better than none at all. I agree, but Larsen-Freeman’s illustrations are vicarious experiences twice-removed.

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4. Levels and variety: I acknowledge the error pointed out by Larsen-Freeman in my table: The Swedish students were children, not adults. I apologize for that inaccuracy. However, I did not accuse Larsen-Freeman of lack of variety in terms of age, level of education, socioeconomic status, or any other potentially important variable. Rather, my only complaint is that four of the methods are illustrated in classes of absolute beginners. It so happens that these are exactly the methods that people often claim are successful only with beginners. I do not say that I agree with those claims; I merely point out that it is unfortunate that the book does not do more to dispel them.

5. Rigidity: I do indeed use the word *rigid* twice when referring to the framework of the book. However, that word does not have negative connotations for me, except in certain contexts. For example, I wrote that “it is unfortunate that in spite of the rigid framework, students are not given enough guidance to achieve a coherent view of the issues involved” (p. 151), If I had meant “rigid’ in a negative sense, I probably would have written “because of the rigid framework,” or words to that effect. The rigid framework is fine: It attracted me to the book in the first place. What is done within the framework is what matters.

6. Differences among methods: Even though the set of answers to the question I isolated for criticism (“What are the goals of teachers who use the method?”) is the most repetitive of the 10, there is much repetitiveness in the answers to most of the other questions also. Take, for example, the view of culture: In five cases we are told that it refers to the daily life, or life-style, of the people; in two cases that it is integrated with language; and in the remaining case (grammar-translation) that it is limited to literature and the fine arts (this is inaccurate; at least in my younger days the grammar-translation method in most European countries included a heavy component of what the Germans call *Landeskunde*— knowledge of life and institutions).

But this in itself is not so important; more serious is the fact that these synopses of principles lead to superficiality in a number of instances. Space is too limited to enumerate them here, but yet another example is the correction of errors. This is indeed done very differently in several of the methods, but nowhere is it suggested that the notion of what constitutes an “error,” or the difference between a major and a minor error, is radically different between one method and the next.
The review sections and activities should stimulate critical analysis and, as a next step, critical self-analysis. The book takes no more than a very small step in that direction.

7. Awareness training: I agree wholeheartedly that awareness is “the fulcrum in language teaching.” What I am saying is that the book itself does not do much to promote awareness. Thus, unless it is used in a program that already stresses awareness training, it will function as a straightforward reader on different methods. As such, the book is very useful, but I expected a lot more, and I am sure Larsen-Freeman expects a lot more.

8. Finally, the question of theory and practice: I do not think that anyone would claim that any of the eight methods are theories that are put into practice in the classroom. Of course they draw on a variety of theoretical principles from various sources, as well as on beliefs, assumptions, and practical experiences. Making the link between theory and practice is an aim of the series, as stated in the editors’ preface, and I was referring to the failure of the book in addressing the stated series’ aim. A related issue is the relation between research and practice. In claiming that a number of my points may be valid for classroom research but unfair demands when pedagogical practice is concerned, Larsen-Freeman suggests a distinction between these two efforts that I reject. The teacher (and crucially the teacher-in-training) must be his or her own researcher, since, as Stenhouse (1975) says, in the end it is difficult to see how teaching can be improved or how curricular proposals can be evaluated without self-monitoring on the part of teachers. A research tradition which is accessible to teachers and which feeds teaching must be created if education is to be significantly improved. (p. 165)

A reviewer is perfectly justified in playing the doubting rather than the believing game. Indeed, if reviewers only played believing games, people would soon stop reading reviews. I evaluated the book in terms of my best judgments as to its potential usefulness for my work and for the students I teach. I found it unsatisfactory in a number of respects, as outlined in the review. I do say, however, toward the end of the review, that it would be worth using the book in a graduate practicum, providing a number of other ingredients are present. Specifically, “a series of teaching tasks following the suggestions made in this book, combined with methodical classroom analysis, might be a challenging new way to approach the practicum” (p. 152). The next time I teach a practicum, I may build the book into the design of the course. But I know that my students
will need to rely on other resources to achieve awareness-raising and self-monitoring.

One cannot believe blindly in everything. I believe firmly in the principles of teacher education outlined by Larsen-Freeman (1983; also the very useful summary to 1987). I doubt, more so now than at the time I wrote the review, that these principles are adequately embodied in the book.

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Comments on John Higgins’s “Artificial Unintelligence: Computer Uses in Language Learning”

A Reader Reacts. . .

Let’s Put the Artificial Back Into Artificial intelligence

D. WELLS COLEMAN
Fulbright Lecturer, University of Lodz, Poland

In reading John Higgins’s recent Forum contribution in the TESOL Quarterly (Vol. 21, No. 1, March 1987), I realized that there are three conclusions some readers may invalidly draw: (a) The computer is just a big dumb calculator; (b) artificial intelligence (AI) is like human intelligence; and (c) the artificially intelligent computer is the computer-as-God. Readers drawing these conclusions will end up with a grossly distorted version of the views of those “who clamor for artificial intelligence solutions” (p. 159) to
problems in computer-assisted language learning (CALL). As O’Shea and Self (1983) have pointed out, “programs based on ideas from artificial intelligence are considerably less dehumanizing than those that are not” (p, 5). In addition, if many of us who count ourselves in the AI camp look carefully at what Higgins does—rather than what he appears to say—we will see little difference between his position and ours.

Higgins says the computer “follows the rules; it is too stupid to do anything else” (p. 164). This is, on the face of it, absolutely true. But many of his readers will already have the misconception of computers as merely big dumb calculating machines (which they are not), rather than as general-purpose symbol-manipulating machines. And Higgins’s statement is likely to unintentionally reinforce this misconception.

Computers can manipulate numbers but are well suited to manipulating symbols of all kinds: letters, words, even semantic features. It is true that they have to follow the rules we give them. But these rules can be extraordinarily complex, to the point that some programs can perform within a surprisingly rich repertoire. In addition, via the random number generator—the computer equivalent of a roll of dice—it is possible to add a certain amount of unpredictability to demonstrations, games, and simulations. Higgins is well aware of all this, as a careful reading (sometimes between the lines) of “Artificial Unintelligence” will show (see also Higgins & Johns, 1984, especially pp. 53-80), but his readers may not be.

The second invalid conclusion the reader may draw from Higgins’s article is that when we talk about computer “intelligence” and human intelligence, we are talking about the same kind of object. Nothing could be further from the truth. AI certainly does not involve the self-awareness we associate with human intelligence. Some researchers in AI have taken the stand that when a computer program simulates intelligent human behavior, the program provides a model of human intelligence. This is one of the assumptions underlying the now classic volume edited by Schank and Colby (1973). Others, notably Weizenbaum (1976) —creator of the famous program ELIZA—have argued convincingly that just because a computer looks like it is doing the same thing as a human (e.g., engaging in conversation in English via a display screen) does not mean that it is. We need to stress the artificial in artificial intelligence. We cannot judge AI in the same terms as human intelligence.
Higgins discusses Rinvolucri’s description of what happens when some computer exercises (of the STORYBOARD sort) are adapted to the blackboard. In Higgins’s terms, when the teachers face the students, they “play the role of GOD, loving, caring, guiding, knowing, chiding” (p. 159). Even when they do not intend to, they signal approval and disapproval, thus dampening the students’ initiative. When they face the blackboard, on the other hand, the teachers take on “the role of NATURE, cruel and unforgiving, sometimes appearing arbitrary but in fact governed rigidly by laws of cause and effect” (p. 159). Higgins champions the computer in the role of NATURE, as an “unintelligent partner” rather than as a “pseudointelligent tutor.”

The problem here involves a possible confusion of the notions of intelligence and control. The teachers described by Rinvolucri are taking an activity that is inherently student centered and (when they face the students) making it teacher centered. It does not work, of course. What makes the activity fail when the teachers “play GOD” is not their intelligence, but the control they exert over the students (a result of their human egos). A large number of programmed instruction-type CALL lessons exist that clearly demonstrate that computer tutors can be unintelligent in any sense of the word. There is similarly no inherent reason why exploratory CALL programs (Higgins, 1986; Higgins & Johns, 1984, pp. 71-73) need be “basically stupid” (pp. 162-163).

Higgins’s TIGLET, a logic game, is a case in point. This program is basically stupid only in the sense that it is not a full-blown, state-of-the-art AI program. In TIGLET, “a tiger cub asks for food and the user must offer it different things to eat” (p. 163). TIGLET expresses its like or dislike of each food offered to it, and the learner tries to guess the three factors that form the basis for TIGLET’s preferences. TIGLET possesses real-world knowledge: information about the features of a number of foods. It can talk about this knowledge; it “understands” the offers of food via a small-scale parser. The parser does not merely analyze grammar, but looks for meaning (admittedly in a very limited domain).

Thus, TIGLET is a small-scale conversational simulation, which sets it apart from CALL programs like FROG (Imlah & duBoulay, 1985), which use parsers solely as ultrasophisticated error-analysis routines. For the input Le bateaum est sorte / e par mon frere qui portira la pain pour le mangir, for example, FROG produces over 20 lines of grammatical critique. This sort of parser thus deals with learner input only at the level of form. The parser of Imlah and duBoulay’s FROG is much more complex than that of Higgins’s TIGLET, but complexity is not the point. FROG’s parsing
capability cannot fairly be called an example of AI because its parser does not take meaning into account. TIGLET’s parser, however limited, does. It treats learner input as a message deserving a response.

Another example of small-scale conversational simulation is a program of mine called TERRI (Coleman, 1985), the scenario for which was suggested by that of Winograd’s (1972) SHRDLU. TERRI is a bare-bones adaptation of SHRDLU for the microcomputer. The computer display shows a scene containing several objects in a room. The learner selects a goal to be achieved, for example, “Get all the black objects off the floor.” The learner types in commands in English, for example, “Put the black box on the white one.” TERRI attempts to decode the input. If (and only if) the program fails to do so, it comments on the grammatical or lexical problem it has encountered.

Each time TERRI succeeds in decoding the input, it checks the command to see (a) whether the objects referred to actually exist in the room, (b) whether it is clear which of them are being referred to, and (c) whether the action can be carried out. If TERRI encounters a problem at this stage, it comments; for example, under the third category, one possibility is “I can’t move it. Something is in the way.” When TERRI “understands” and determines that it can carry out a command, the program does so on the animated screen display.

TERRI’s real-world knowledge is more sophisticated than TIGLET’s, including information about eight objects—their shapes, colors, and locations. TERRI also possesses rules about moving the objects. For example, TERRI will not try to pick up an object if another object is on top of it. TERRI’s parser is also more sophisticated; for example, it is able to decode the pronoun one in certain discourse contexts:

Learner: Put the wedge on the white can.
TERRI: I’m thinking . . .
OK
Learner: Put the black box on the black one.

But these are differences in degree, not in kind. The similarities between TIGLET and TERRI are greater than the differences. On an evolutionary scale of artificial intelligence, both are definitely examples of lower order AI. Still, both are conversational simulations; they focus primarily on the communicative aspects of language, not on form. In both situations, the learner initiates and the program responds (see Higgins, 1982, especially pp. 102-103).
Increasing the artificial intelligence of the program does not put it in control but merely increases the range of “intelligent” responses it can offer. This is why O’Shea & Self (1983) call such programs “less dehumanising” (p. 5) and why some of us working in CALL search for artificial intelligence solutions to problems in the field.

REFERENCES


The Author Responds...

JOHN HIGGINS

*University of Bristol*

Any disagreements that D. Wells Coleman and I have seem to be much more about terminology than about substance. If his comments have removed misconceptions in the minds of any readers of my article, that is something I welcome.

Working, as I do, largely among teachers who are unfamiliar with computers, I find that there is more danger that they will overestimate the machine’s powers than underestimate them. Far from seeing the computer as a big dumb calculating machine or
even as a symbol-manipulating machine, they see it as a people-manipulating machine. Hence my deliberately debunking title and my stress on the machine’s slave role (a metaphor that is further developed in Higgins, in press).

My stress on artificial unintelligence does not have to imply rejection of all work in artificial intelligence, especially not of the kind Coleman describes. It is, however, intended to sound a warning against the indiscriminate pursuit of “intelligent tutoring systems.” My favorite passage from Weizenbaum (1976) is the one in which he warns us that the ordinary person needs to be, but is not, capable of observing AI artifacts with “a very great skepticism (the kind we bring to bear while watching a stage magician)” (p. 9). We can expect the skepticism to develop as computing becomes more widely taught. Meanwhile teachers and learners who apply a model of human intelligence to explain the workings of artificial intelligence are threatened with at best disappointment, at worst delusion. Coleman’s title hits the nail on the head.

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