Language use by pairs of ESL students
working on interactive computer language programs

by

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As opportunities for educational computing have increased in recent years, teachers of English as a second language (ESL) have looked for ways to use the new technology to benefit their students, and many have become enthusiastic about the possibilities of this medium of instruction. However, some have been disappointed by the fact that the present state of the art does not permit the kind of communicative practice they feel their students need to become proficient.

Many computer assisted language learning (CALL) programs are drill and practice or tutorial. Both of these lesson types are consistent with earlier approaches to second language teaching. Drill and practice grew naturally out of the structural linguists' view that language is composed of a large number of discrete points. This belief is embodied in the audiolingual method of language teaching, popular in the 1950s and 1960s, which presents one point at a time and requires students to practice it until its correct use becomes habitual. Building on the Chomskyan notion that from a limited number of descriptive sentence-structure rules an unlimited number of utterances can be generated, tutorials add a dimension from the so-called cognitive-code approach of the late 1960s and early 1970s by giving learners explicit rules about language structures. Both repetitive exercises in so-called Skinnerian fill-in-the-blank format and explicit rule-teaching fit in well with what the computer can do easily, in that the language the computer
provides can be completely specified by the program designer and then manipulated in response to student input. However, while the audiolingual and cognitive-code approaches are still being used to some extent in many language classrooms, second language teachers are now realizing the importance of the communicative aspects of language learning. The earlier emphasis on language form is being replaced by attention to language function, i.e., "the communicative purpose . . . [the learner] wishes to express and to understand" (Finocchiaro and Brumfit, 1983, 22). Language teachers, therefore, are attempting to reduce the use of mechanical practice of form and seeking opportunities for students to develop communication skills in various sociocultural settings.

Interestingly, this shift has had little impact on CALL. In reviewing CALL programs, one finds that few of them permit anything approaching authentic communication (Underwood, 1984). The basic reason for lack of communicative CALL is the computer's inability to understand human language and to respond in the ways human beings do. Existing simulated conversation programs are disappointing for they have no real understanding of the user owing to the limited development of artificial intelligence (AI). While AI has been explored since the 1950s, no one has attempted to apply it to ESL until very recently and the results are still not satisfactory. Thus, real open-ended communication in CALL is presently impossible.

Despite this limitation, many teachers have recognized that computers hold a fascination for their students and have tried various
methods of adapting existing programs to meet their needs. One of their solutions has been to use computer programs as a stimulus for group discussion. Learners work together through the programs and, given this collaborative task, generate meaningful talk. Thus, computer programs create an environment in which students can use real language in interaction with real people. However, in spite of the fact that many have argued for this type of activity (Green, 1984; Wyatt, 1984; Sanders and Kenner, 1983; Underwood, 1984; Higgins and Johns; Ahmad et al., 1985), little evaluation of its effectiveness has been undertaken. Accordingly, more thorough and extensive analysis of the language generated among learners in response to computer lessons must be carried out in order to assess the value of this type of language practice.

The current study was designed to provide such evaluation. Its purpose was to investigate what happens when computer programs are used in an attempt to stimulate meaningful communication in group activities. Specifically, this study compares the language—in terms of function and form—that three computer programs stimulate students to produce. It is hoped that this exploratory study will supply some preliminary guidelines for the use of this activity in second language classrooms, inviting more fuller subsequent studies in this area.
CHAPTER II

REVIEW OF LITERATURE

Several areas of research pertinent to the present study will be reviewed in this chapter. The theoretical considerations behind communication-oriented second language instruction will be taken up first, followed by a discussion of how the proposed solution in CALL—using computers to stimulate group discussion—puts this theory into practice. Lastly, related studies of the language generated among computer program users will be reported.

Theoretical and Conceptual Formulation

Three ESL teaching approaches are related to the current study: the communicative approach, the notional-functional approach and the Natural Approach. While there is a close relationship among them, their focuses are different. We might say that the communicative approach is an umbrella term, under which the Natural Approach and the notional-functional approach represent different emphases.

The communicative approach

In the communicative approach, instruction is designed to foster a learner's "communicative competence." The advocacy of communicative competence (as opposed to linguistic competence) arose as a reaction to a perceived deficiency, at least for second language learners, in
Chomsky's earlier definition of competence, the linguistic system (or grammar) that an ideal native speaker of a given language has internalized (Chomsky, 1965). In his definition, Chomsky did not address the sociocultural significance of an utterance in its context, emphasizing only descriptive rules of syntactic structures. Thus, people arguing for communicative competence are broadening the definition of what it means to learn a language. Yet they do not have a uniform definition of communicative competence. Some view it merely as the counterpart of linguistic (grammatical) competence (Allen, 1978; Palmer, 1978; Paulston, 1974), whereas others view the former entailing the latter (Morrow, 1977; Munby, 1978; Savignon, 1972). A still broader definition is proposed by Canale and Swain (1980, 1981): communicative competence is composed of grammatical competence, sociolinguistic competence and strategic competence (1980; 1981). Grammatical competence is linguistic competence concerned with "knowledge of lexical items and rules of morphology, syntax, semantics and phonology" (1981, 32). Sociolinguistic competence "is made up of two sets of rules: sociocultural rules of use and rules of discourse" (1981, 33). The former specifies the ways in which utterances are produced and understood appropriately in certain communicative situations. The latter concerns the cohesion (i.e., grammatical links) and coherence (i.e., appropriate combination of communicative functions) of groups of utterances (1981). Strategic competence is "the compensatory communication strategies to be used when there is a breakdown in one of the former competences" (1980, 27).
Under this view, the ability to use a language meaningfully and appropriately in realistic situations becomes the major goal of language learning. Many ESL scholars today maintain that a learner has to use the target language in communicative situations in order to acquire the ability to communicate. Experts in second language pedagogy (see, for example, Brown, 1980, and Rivers, 1983) are suggesting that contextualized, appropriate, and meaningful communication is the best possible practice second language learners can engage in.

One of the most important implications of the communicative approach is that a second language syllabus should be organized on the basis of communicative functions for all stages of second language learning. A functionally based communicative approach is more likely to have positive consequences for learner motivation than is a grammatically based communicative approach (Canale and Swain, 1980). This view forms the basis for the notional-functional approach, which I will discuss in the next section.

In classroom practice, teachers look for opportunities for students to use the target language in a creative, meaningful and communicatively appropriate way. Given this opportunity, Underwood states, "[s]tudents will spend more time saying what they want to say, what they somehow need to say . . . and less time saying silly or irrelevant things that the book or the teacher or the tape would have them say" (1984, 20). The teacher's primary task thus becomes constructing situations that lead to real use of the target language. One way to set up this situation is to give tasks involving an information gap, i.e., tasks
in which "students each have different information and work in pairs or small groups to complete the task by sharing their information and negotiation" (Richards, 1985, 77).

The notional-functional approach

Originating in Europe, the notional-functional approach claims that language learning should meet students' needs, focusing on what people want to do or what they want to accomplish (Finocchiaro and Brumfit, 1983; Berns, 1984). In defining this approach in the 1970s, its advocates claimed that "language was much more appropriately classified in terms of what people wanted to do with language (functions) or in terms of what meanings people wanted to convey (notions) than in terms of the grammatical items as in traditional language teaching models" (Finocchiaro and Brumfit, 1983, 12). In this view, neither grammar nor situations of language use are excluded, yet the primary focus is the learner and the functions of language (Finocchiaro and Brumfit, 1983).

The implication of this view is that a given learner, with his/her special learning objectives, needs to be able to carry out certain communicative functions (e.g., apologizing, describing, inviting and promising). To do so, s/he must learn the ways in which particular grammatical forms may be used to express these functions appropriately (Canale and Swain, 1980).
The Natural Approach

In the United States, another view has arisen of how communicative competence can be achieved. This is Krashen and Terrell's "Natural Approach" (1983). As the name implies, the main claim in this approach is that it is possible to learn a second language in much the same way that a first language is learned. The Natural Approach thus sets out some procedures which enable students to achieve communicative competence.

The primary concept that underlies the Natural Approach is the acquisition-learning distinction. According to Krashen and Terrell, "acquiring a language is 'picking it up,' i.e., developing ability in a language by using it in natural, communicative situations," whereas "[l]anguage learning is 'knowing the rules,' having a conscious knowledge about grammar" (1983, 18). Krashen and Terrell hold that this conscious knowledge has a limited function in second language communication because it is used only to monitor language generated by the acquired system, and that its application requires time to locate errors, conscious concern about correctness and the knowledge of what is correct, i.e., rules. Thus, acquisition is more important than learning in developing communication ability and fluency. In the Natural Approach, acquisition activities are regarded as central; therefore, most class time is devoted to activities which promote acquisition, such as dialogues, problem-solving, and games.

The second important conceptual point in the Natural Approach is the input hypothesis, which states that only when people understand messages
in the target language can they acquire its form. The messages which are understood are called comprehensible input. There are several forms of simplified input facilitating learner understanding: foreigner talk (the modified utterances native speakers make when talking to non-native speakers), teacher talk (foreigner talk in the second language classroom), and interlanguage talk (the speech other second language acquirers use). The first two types are the most desirable because they provide samples of authentic (or almost authentic) native speaker usage. However, in spite of the problem inherent in interlanguage talk as comprehensible input, two empirical studies suggest that interlanguage talk enhances negotiation, which can serve as comprehensible input for ESL learners. Porter (1983), investigating language by ESL learners in pair work, concludes that genuine communicative practice, including negotiation, does occur in interaction of non-native pairs. Varonis and Gass (1983) compared frequency of negotiation in non-native and native/non-native pairs and argue for the value of non-native conversation as a non-threatening context where students can manipulate input in order to eliminate confusion and make input more meaningful and thus aid second language acquisition. Therefore, it would seem that interlanguage talk can be a useful source of comprehensible input if native-speakers are not available.

Basically, the Natural Approach encourages listening first and speaking in the later stage of second language acquisition because Krashen and Terrell hold that learners acquire from what they hear (or read) and understand, not from what they say (1983). However, Swain
(1985) complements the notion of comprehensible input by pointing out the importance of comprehensible output. While Krashen (1981) suggests that the only role of output is to generate comprehensible input, Swain states that output provides "the opportunities for meaningful use of one's linguistic resources" (1985, 248). In arguing for learning to speak by speaking, she notes two functions of output: it provides the learner with opportunities "to test out hypotheses—to try out means of expression and see if they work" (1985, 249) and it forces the learner "to move from semantic processing to syntactic processing" (1985, 249). Therefore, creating opportunities for learners to listen to the target language is not enough. Providing opportunities for speaking is of equal importance.

A third important concept in the Natural Approach is the affective filter hypothesis. Krashen and Terrell hold that certain learner characteristics—motivation for language learning, positive self-image, and low anxiety level—are related to second language acquisition. Those learners who possess optimal characteristics have a lower "affective filter." A lower affective filter means that "the performer is more 'open' to the input, and that the input strikes 'deeper'" (Krashen and Terrell, 1983, 38).

Thus, the goal of the Natural Approach is still the development of communication skills; the means to achieving this goal are comprehensible input and lowering of the affective filter to foster acquisition.
Krashen and Terrell suggest that one way to foster acquisition is to encourage group activities. In line with this thinking, Long and his colleagues have studied the potential of small group work, as opposed to large classroom activities (Long, 1975; Long et al., 1976; Long, 1977). Long and Porter (1985) summarize five pedagogical arguments for the use of group work in second language learning: to increase the quantity of language practice opportunities, to improve the quality of student talk ("the varieties of things students ... [do] with language" (Long et al., 1976, 138)), to individualize instruction, to create a positive affective climate, and to motivate learners.

Group work, in Long and his colleagues' opinion, is an attractive alternative to the teacher-led mode and a viable substitute for individual conversations with native speakers. Furthermore, group work can enhance the development of communicative competence.

Long and Porter (1985) review research comparing group work with teacher-led activities and summarize the results as follows:

a. Students receive significantly more individual language practice opportunities in group work than in teacher-led lessons (Long et al., 1976; Doughty and Pica, 1984; Pica and Doughty, 1985).

b. Students perform at the same level of grammatical accuracy in group work as in teacher-led lessons (Pica and Doughty, 1985).

c. The range of language function (variety of practice) is wider in group work than in teacher-led lessons (Long et al., 1976).
Using group activities suggested by the Natural Approach, Long et al. (1976) in their study investigated the language of ESL learners in a small group activity and a teacher-led activity. They coded the language which students produced in both activities by means of a scheme that includes a list of 35 language functions subdivided into three categories: pedagogical moves, social skills and rhetorical acts. They found that both the quantity (total number of acts) and the quality (number of different kinds of acts) of language function were higher in the small group activity than in the teacher-led activity.

d. The type of task in small group work affects the language students produce (Long, 1980, 1981; Doughty and Pica, 1984). Specifically, these studies found that two-way tasks, in which information was exchanged by all group members, stimulated more and better language than one-way tasks. Problem-solving activities are characterized as two-way tasks, in that group members carrying out these activities need to contribute their own information, experiences and judgements to accomplish tasks.

Another study elaborating on this point is closely related to the current study. Tong-Fredericks (1984) compared the language generated by ESL learners in three oral communication activities—problem-solving, role play and authentic/natural interaction (conversation)—by looking at frequency of turn-taking, frequency of self-correction, and speed of speaking. She found that the activities elicited language that differed along all three dimensions. The most notable variation was in self-correction (much more frequent in the problem-solving activity than in
"Communicative" CALL

Underwood (1984) uses the principles of communicative language teaching to set up some guidelines for what he terms "communicative" CALL (as opposed to the old "wrong-try-again" model). Of relevance here is the following statement:

"Communicative CALL will create an environment in which using the target language feels natural, both on screen and off. An important source of comprehensible input that is often overlooked in the discussion of computer materials is the communication that usually takes place, not between computer and users, but between users. Programs tend to be used by small groups, often pairs, of students, rather than by students working alone. Invariably the students get involved in much healthy discussion centering on how you make the thing work or the best way to solve the problem" (1984, 53-54).

Three aspects of this statement are elaborated on by others interested in the discussion stimulated by computer programs (hereafter referred as "computer talk").

(1) Computer talk sets up a communicative environment for the authentic use of the target language.

While students are participating in computer talk, they are not manipulating language in a vacuum. Nor are they mechanically repeating segments of language. They are communicating in the target language. They are using the target language with real people, trying to get meaning across, and producing responses based on comprehension of
others' utterances; thus, their products are meaningful communication instead of rote prefabricated repetition (Underwood, 1984). Wyatt notes that the result of computer talk "is fascinating and valuable conversational practice. Since the students are essentially cooperating to battle against the computer, their interactions and language are highly authentic" (1984, 89). Using computer talk can suspend students' awareness of the classroom situations and allow students to indulge in realistic and purposeful language use. The authenticity of utterances stimulated in this activity is seldom seen in oral activities of traditional classrooms (Wyatt, 1984).

Wyatt (1984) further notes that any software can provide a context for valuable conversation as long as it is interesting to students and comprehensible to them in linguistic and cultural terms. While students are carrying out computer talk, they attend to meaning rather than form. This interaction can serve as one source of comprehensible input and also output to enhance acquisition.

(2) Computer talk facilitates practice of communicative functions.

Ahmad et al. (1985) note that in computer talk, students need to communicate with each other to accomplish the task. "In coming to decisions, or evaluating their actions, the members of the group will need to use many different language functions, such as warning, persuading, asking questions, expressing conditions, and admonishing and so on" (Ahmad et al., 1985, 111). Computer talk thus provides the context needed to increase the use of language functions and practice social and communicative skills.
Computer talk provides communicative practice by means of small group activities.

Computer talk, as group work, develops communicative competence. Sanders and Kenner call attention to the social aspects of computer assisted instruction (CAI): "Where we had been thinking of CAI as an individual learning tool (almost by definition), the students' perception of the computer had been social from beginning to end" (1983, 37). They also note that in working on CALL programs, the ESL students they were observing usually got together around a terminal to help and encourage each other. The results in terms of language practice were valuable because "real communicative practice took place, especially if the students were of mixed language backgrounds" (1983, 37).

Review of Studies on Group Activities with Computers

A limited amount of research has been done to evaluate the use of computer talk. Two studies are related to the current research. Hawkins et al. (1984) examined how pairs of children, native speakers of English, worked together to solve computer programming problems and compared the children's collaborative work for two programming problems of unequal difficulties. Besides noting that children were willing to work together, they also found that more evaluative discussion of work occurred in more difficult programming problems. More importantly, they found that in planning how to solve a problem, children engaged in some form of negotiation about what was to be done. In actually typing in the problems, children did much task-
related talking. This study substantiates the premise that some sort of computer talk will be generated among learners by computer-related tasks.

The only study on computer talk in ESL was carried out by Piper (1985). Her subjects were three multilingual groups of three foreign learners working on three CALL programs. From 20-minute video recordings of each group working on each program, she coded the language generated according to whether it involved repetition of the content in the program, management of the computer or discussion of the task. Piper found that the types of language in computer talk varied with different CALL programs. She also found that, in contrast with Tong-Fredericks' subjects, who worked in non-computer activities, her subjects did not self-correct in any of the programs. In addition, Piper's subjects used a limited range of language forms (e.g., only present tense) and vocabulary.

The Present Study

Piper's study provides an important beginning for assessing the value of computer talk for ESL students. The present study explores further the nature of this kind of communicative activity. Here, computer talk of pairs of ESL subjects working on three programs was examined to find at least partial answers to the following questions:

(1) How much talk is stimulated by the computer programs used in this study?

Since comprehensible input and output are important for second language
acquisition, quantity becomes one of the significant criteria in evaluating computer talk.

(2) How complex is this computer talk?
Although communicative language learning emphasizes fluency and appropriateness, the definition of communicative competence, according to Canale and Swain, still entails language form, linguistic (grammatical) competence. Therefore, the complexity of form in computer talk is also of interest in the present study.

(3) How concerned are learners with the accuracy of form of computer talk?
Related to question 2 is the issue of whether learners are concerned with correctness of form of language in computer talk. The current study attempts to discover the extent to which learners are attending to accuracy while carrying out computer talk.

(4) a. What range of language functions do learners employ in computer talk?

b. Does the frequency of the various functions vary with computer program?
Communicative language learning focuses on language function; therefore, a major reason for studying computer talk is to discover the type and frequency of functions that students use as they work together on various kinds of programs.
CHAPTER III
RESEARCH METHODS

Subjects

Ten ESL adult students, four female and six male, were asked to participate in this project, with four in a pilot study and six in the main study. They were all volunteers from intermediate or advanced levels (levels 4-6) in the Intensive English and Orientation Program (IEOP) at Iowa State University, with their TOEFL (Test of English as a Foreign Language) scores ranging from 400 to 543 at the time of the study. They were from a variety of countries—China, Japan, Malaysia, Indonesia, Egypt, and Portugal—with various cultural and educational backgrounds, and worked in pairs on the computer programs presented in the study.

Pilot Study

A pilot study was conducted in October, 1985, with four male students—a Chinese-Chinese pair and a Japanese-Indonesian pair. The purposes of this pilot study were to find three programs which elicited considerable discussion but differed in content and approach, to try out the two coding schemes for learner talk reported in the literature by Piper (1985) and Long et al. (1976), and to refine the procedures used to collect data.

After a short on-line orientation (10-20 minutes) to the Apple II+ microcomputer used in the study, the subject pairs were asked to work
through several programs. All subject talk was audiotaped. The first pair used a free communication program ("Eliza") for 30 minutes, a problem-solving simulation ("Lemonade Stand") for 30 minutes, and three grammar lessons on causative Have, If Clauses, and articles for ten minutes each. Of the three grammar lessons, the one on articles seemed to elicit the most discussion, so it, along with "Eliza" and "Lemonade Stand," was presented to the second pair of subjects. The two trials indicated that these three programs appeared to meet the requirements outlined above and were selected for use in the main study. They are described in more detail in the next section.

After data were gathered, the second five minutes of recording in each program was transcribed and coded using the two schemes. Both schemes were found helpful in evaluating language functions subjects used, and it was decided to use both in the main study.

Two procedural changes were made on the basis of experience gained from the pilot study. First, a printed instruction sheet was developed for use in the main study to eliminate confusion in "Eliza" and to achieve consistency throughout the three computer programs. Second, a set of guidelines for intervention by the investigator was drawn up. Both the instruction sheet and the guidelines are shown in Appendix A.

Computer Programs Used

As noted above, the programs used in this study were "Articles," "Lemonade Stand," and "Eliza." In "Articles," which uses a drill and practice format, subjects were required to decide whether a displayed
sentence had errors in article usage and to type in a correct sentence if it did. In "Eliza," the computer carries on a dialogue with the user by asking questions based on key words in user responses. This program is designed to simulate an interactive dialogue in the style of a psychoanalysis session. Subjects were required to type in responses and the computer replied to them. In "Lemonade Stand," users make decisions about operating a lemonade stand by manipulating the variables of the amount of lemonade to be prepared, the number of advertising signs, and the amount each glass should sell for. Subjects were required to type in numbers and the computer indicated the result of their investment.

Procedures and Treatment of Data

The main study was conducted in November 1985. Data were gathered from three subject pairs. The members of each pair had different first languages: Portuguese-Arabic (Egyptian), Japanese—Chinese (Hong Kong), and Malaysian-Japanese. Before data collection was begun, the subjects' classroom teachers were consulted to ensure that students working together would have a harmonious relationship. After receiving an orientation to the computer and the printed instruction sheet developed from the pilot study experience, each pair spent approximately 30 minutes on each program (two programs one day, the third on another day). The programs were presented to the three pairs of subjects in different sequences to avoid an ordering effect. For the first pair, the order was "Lemonade Stand," "Articles," and "Eliza." For the second pair, the order was "Articles," "Lemonade Stand," and "Eliza." For the
third pair, the order was "Articles," "Eliza," and "Lemonade Stand."
Subjects were video- and audiotaped while they were working on the
programs (each for 30 minutes).

Data were transcribed from the audiotapes and analyzed to provide
the answers to the research questions posed in Chapter II. (The
investigator's intervention in each transcript, regarded as human-
stimulated instead of computer-stimulated talk, was not considered as
part of the data.) As part of this data analysis, Piper's and Long et
al.'s coding schemes, modified slightly to accommodate the data (see
next chapter) were used. Coding was done by the investigator first.

Videotapes showing screen displays were consulted as necessary to
interpret comments made by the subjects. Then, the investigator and the
thesis advisor checked the transcript and coding together and resolved
any areas of disagreement.¹

¹ Coding such as that done in this study is always somewhat
problematic because it involves some guessing at subjects' intentions.
Another difficulty is maintaining consistency over the entire coding
procedure. To ensure consistency here, several steps were taken. After
the investigator had coded all the data, the thesis advisor viewed all
the videotapes and discussed with the investigator the coding of each
item. The investigator then spot checked items in each transcript for
consistency over the entire study. Finally, before carrying out a
statistical analysis (see Chapter IV), the investigator classified the
coded data into more inclusive categories and once again looked at each
item to see that it was in the appropriate category.
CHAPTER IV
RESEARCH RESULTS

Quantitative Analysis of Data

The data collected in this study were analyzed in order to provide answers to the four questions raised in Chapter II.

(1) How much talk is stimulated by the three computer programs used in this study?

(2) How complex is this computer talk?

(3) How concerned are subjects with accuracy of form?

(4) a. What range of language functions do subjects employ in their computer talk?
   b. Does the frequency of use of the various functions vary with program?

In the sections below, indicators used to answer each question will be discussed first, followed by the results.

Quantity of talk

To answer the first question, an indicator used in Tong-Fredericks' (1984) study of talk in group work, speed of speaking, was used. This measure was obtained by dividing the total number of words spoken by the total time \(^2\) for each transcript. Table 1 shows the averages for the

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\(^2\) The total times in the transcripts after talk between subjects and the investigator was removed ranged from 19.9 to 28.7 minutes.
three subject pairs for each program. For comparison, the results from Tong-Fredericks' study are also presented (see Table 2).

Table 1

Quantity of Talk in the Present Study

<table>
<thead>
<tr>
<th>Program</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
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<tr>
<td>average words/ min</td>
<td>51.9</td>
<td>36.6</td>
<td>45.0</td>
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Table 2

Quantity of Talk in Tong-Fredericks' Study

<table>
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<th>Activity</th>
<th>Problem-solving</th>
<th>Role play</th>
<th>Conversation</th>
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<tr>
<td>average words/ min</td>
<td>111</td>
<td>121</td>
<td>127</td>
</tr>
</tbody>
</table>

While the tasks in the two studies are not the same, it is evident that quantity of talk is far less in this study (with computers) than in Tong-Fredericks' oral communication activities (without computers). One reason for this difference may be the time required in the present study for subjects to read the computer screen and type in responses. It also may be that Tong-Fredericks' subjects were more proficient in English. In the present study, "Lemonade Stand" stimulated the largest amount of talk.
Complexity of talk

To answer the second question, three indicators were used: frequency of turn-taking (rate of change of speaker, represented as number of turns per minute), number of words per turn, and frequency of use of connectors. The rationale for using the first two (different measures of turn length) is that longer turns, on average, should produce more complexity in language. The rationale for the third is that frequency of use of connectors is an indication of sophisticated sentence structures. For frequency of turn-taking, the total number of turns was divided by the total time for each transcript. Length of turn was calculated by dividing the total number of words by the total number of turns for each transcript. The frequency of use of connectors was obtained by dividing the total number of connectors used by the total time for each transcript. Table 3 shows the data from this study. Table 4 shows results from Tong-Fredericks' study. Tong-Fredericks did not measure the frequency of use of connectors.

---

3 Both subordinate connectors (if, because, etc.) and coordinate connectors (but, and, etc.) were counted when they joined two ideas (either completely or incompletely expressed). For instance, in the following exchanges:

A: 20 [glasses of lemonade].
B: Unn?
A: Because I want to use advertising.

Here "because" showed a cause and effect relationship between two utterances of the same speaker A and thus was counted. However, in this example,

A: Ok?
B: No, because .
A: Are you sure?

"Because" was not counted since it did not connect two ideas.
**Table 3**

Quality of Talk in the Present Study

<table>
<thead>
<tr>
<th>Program</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of turn-taking (No. of turns/min)</td>
<td>7.5</td>
<td>6.9</td>
<td>8.7</td>
</tr>
<tr>
<td>Length of turn (words/turn)</td>
<td>6.9</td>
<td>5.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Connectors used (No. of connectors/min)</td>
<td>0.5</td>
<td>0.2</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Table 4**

Quality of Talk in Tong-Fredericks' Study

<table>
<thead>
<tr>
<th>Activity</th>
<th>Problem-solving</th>
<th>Role play</th>
<th>Conversation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of turn-taking (No. of turns/min)</td>
<td>13.0</td>
<td>9.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Length of turn (words/turn)</td>
<td>8.5</td>
<td>13.4</td>
<td>11.5</td>
</tr>
</tbody>
</table>

While the frequency of turn-taking data would indicate that turns
were longer in the present study than in Tong-Fredericks' study, the length of turn data show the opposite. The reason for this apparent discrepancy is probably that considerable time was required in the present study to read the screen and type in responses. Thus, the length of turn is a more reliable indicator of this aspect of complexity. Table 3 also shows that connectors were seldom used in this study. This indicates that single-clause sentences or even partial-clause sentences were used more frequently than sentences with more than one clause. Thus, the computer talk that the subjects in this study engaged in was not very complex, at least in terms of the indicators used here. These results are consistent with those of Piper (1985) in her study of computer talk (although it is not clear whether Piper's subjects were at the same level of proficiency as the subjects in this study).

Concern with accuracy

To answer the third question, frequency of self-correction was used as an indicator. It was obtained by dividing the number of self-corrections by the total time for each transcript. The averages for the three pairs in the present study are shown in Table 5, and again for comparison, Tong-Fredericks' results with respect to self-correction are shown in Table 6.
Table 5

Rate of Self-Correction in the Present Study

<table>
<thead>
<tr>
<th>Program</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-correction/min</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Table 6

Rate of Self-Correction in Tong-Fredericks' Study

<table>
<thead>
<tr>
<th>Activity</th>
<th>Problem-solving</th>
<th>Role play</th>
<th>Conversation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-correction/min</td>
<td>1.0</td>
<td>4.8</td>
<td>5.8</td>
</tr>
</tbody>
</table>

It can be seen that in comparison with subjects in Tong-Fredericks' study, subjects in this study self-corrected infrequently. Again, these results are in accord with those of Piper (1985), who found no self-correction in her study.
Range of language function and program difference

A number of indicators were used to answer the fourth question. First, Piper's three-way classification was used to code acts. Piper's categories are:

Repeat: repeat directly from somewhere (screen, partner or instructional sheet)

Manage: manage computer keyboard or tasks

Discuss: discuss something related to or cued by tasks

The acts for each category in each transcript were totaled and divided by the total time in that transcript to make data for the three programs compatible. Table 7 compares the three programs with respect to each category.

---

4 In all of the coding in this section, an act is the basic unit. A turn contains one or more acts. Each act was placed into a single category; in cases where more than one category seemed appropriate, the act was classified according to its primary function.
Table 7
Talk in the Present Study Classified by Piper's Scheme

(Average Acts/Min)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat</td>
<td>1.43 (16%)</td>
<td>3.05 (33.5%)</td>
<td>3.75 (34%)</td>
</tr>
<tr>
<td>Manage</td>
<td>0.71 (8%)</td>
<td>0.11 (1%)</td>
<td>0.70 (6%)</td>
</tr>
<tr>
<td>Discuss</td>
<td>6.96 (76%)</td>
<td>5.96 (66.5%)</td>
<td>6.62 (60%)</td>
</tr>
</tbody>
</table>

The first number in each entry is the average number of acts/minute in the category. The number in parentheses represents the percent of acts in this category compared with the total number of acts in that program.

Subjects carried out much less managing than repeating or discussing, which suggests that they did not have difficulty in operating the computer. Subjects repeated more in "Articles" and "Eliza" than in "Lemonade Stand." The amount of discussion varied slightly with program.

For comparison, Piper's results for three computer language programs are shown in Table 8.

While Piper's programs were different from the ones used in the present study, her results show that discussion was the most important category in two of them and that the mix of acts varied with program.
Table 8

Percentages of Acts Designated as REPEAT
MANAGE and DISCUSS During a Five Minute Period in Piper's Study

<table>
<thead>
<tr>
<th>Categories</th>
<th>Clozemaster&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Word Order&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Copywrite&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPEAT</td>
<td>14</td>
<td>54</td>
<td>8</td>
</tr>
<tr>
<td>MANAGE</td>
<td>26</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>DISCUSS</td>
<td>60</td>
<td>39</td>
<td>88</td>
</tr>
</tbody>
</table>

<sup>a</sup> Clozemaster: a cloze passage
<sup>b</sup> Word Order: reordering jumbled words into correct sentence
<sup>c</sup> Copywrite: a text reconstruction task

To obtain a more detailed picture of language function which subjects were using in their computer talk, each category in Piper's scheme was subdivided as follows:

1. REPEAT
   - R1: repeat directly what is on screen (read words on screen when they appear first time)
   - R2: repeat what partner or instructional sheet said
   - R3: other kind of repeating (e.g., repeat words on screen second time, repeat own words or answers, restate what is on screen, adding some fillers)

2. MANAGE
   - M1: manage the computer keyboard ("Return," "Space," etc.)
M2: manage tasks (show willingness to continue tasks, tell partner to continue, give a command to type, etc. In "Lemonade Stand," calculate costs.)

3. DISCUSS

D1: discuss something related to tasks (In "Articles," discussion of article usage belongs in this category.)

D2: discuss language (spelling, meaning of words, etc. In "Articles," discussion of language not related to article usages belongs in this category.)

Table 9 compares the three programs with respect to these subcategories. It was found that most of the repetition was in the third category (R3), that is, modified repetition instead of direct echoing from screen or other subjects. Most of the management was in the second category (M2), managing tasks. "Eliza" elicited the least M2 acts (perhaps because it did not require much task management), whereas "Lemonade Stand," involving calculation, had the highest number of acts in this category. For all three programs, the overwhelmingly largest number of acts was in category D1: discuss something related to tasks.

What kind of language were subjects using as they discussed the tasks? Since language function is emphasized in communicative language teaching, it would seem useful to analyze acts in the Discussion categories (D1 and D2) in more detail. The scheme developed by Long et al. (1976) was used as the basis for this analysis, with categories added as needed to account for acts observed here but not noted in Long et al.'s research. Long et al.'s scheme (with additions) is shown in Appendix B. A portion of one of the transcripts coded by the modified version of both Piper's and Long et al.'s scheme is shown in Appendix C.
Table 9

Talk in the Present Study Classified into Categories Using Modified Piper's Scheme (Average Acts/Minute)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.47</td>
<td>0.80</td>
<td>1.41</td>
</tr>
<tr>
<td>R2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.35</td>
<td>0.89</td>
<td>0.54</td>
</tr>
<tr>
<td>R3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.61</td>
<td>1.36</td>
<td>1.80</td>
</tr>
<tr>
<td>M1&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.08</td>
<td>0.00</td>
<td>0.24</td>
</tr>
<tr>
<td>M2&lt;sup&gt;e&lt;/sup&gt;</td>
<td>0.62</td>
<td>0.11</td>
<td>0.46</td>
</tr>
<tr>
<td>D1&lt;sup&gt;f&lt;/sup&gt;</td>
<td>6.95</td>
<td>5.08</td>
<td>5.79</td>
</tr>
<tr>
<td>D2&lt;sup&gt;g&lt;/sup&gt;</td>
<td>0.01</td>
<td>0.88</td>
<td>0.83</td>
</tr>
</tbody>
</table>

<sup>a</sup> R1: repeat directly from screen  
<sup>b</sup> R2: repeat from partner or Instruction Sheet  
<sup>c</sup> R3: other "repeats"  
<sup>d</sup> M1: manage computer keyboard  
<sup>e</sup> M2: manage tasks  
<sup>f</sup> D1: discuss tasks  
<sup>g</sup> D2: discuss language

However, Long et al.'s scheme contains too many categories to show meaningful differences in programs. Therefore, after the coding was completed, the categories were regrouped (and in some cases relabeled) under six major headings as follows (examples of each category are shown in Appendix D):
I. Managing discussion

A. Managing mechanics of discussion

1. Focuses discussion
2. Completes/ends discussion
3. Extends previous contribution
4. Rephrases
5. Requests more time to think
6. Competes for floor
7. Completes partner's unfinished utterance
8. Insists on own view
9. Suggests an (another) answer (local changes in displayed sentence, number, word, etc.)
10. Shows uncertainty or lack of understanding

B. Managing strategies for accomplishing tasks

1. Makes a decision
2. Expresses purpose
3. Invites participation
4. Advises
5. States generalization
6. Expresses cause/effect
7. Draws logical conclusion
8. Suggests a (another) strategy or answer
9. Evaluates previous course of action or computer's response
10. Predicts/evaluates possible course of action

II. Establishing facts needed to perform task

A. Inquiring

1. Asks for information
2. Asks for clarification/repetition
3. Expresses confusion
4. Asks if partner understands
5. Asks for partner's opinion/suggestion
6. Asks for confirmation
7. Asks for agreement

B. Responding

1. Expresses understanding
2. Answers questions
3. Clarifies
4. Corrects partner's misunderstanding
5. Agrees
6. Disagrees
7. Confirms  
8. Shows (sudden) awareness of situation  
9. "Responds to screen or interprets computer's response"  
10. Exemplifies  
11. Shows lack of belief (of computer's response)  
12. Questions partner's suggestion

III. Showing concern for language form

1. Asks for information about target language  
2. Answers questions about target language  
3. Spells words for typist  
4. Corrects spelling or punctuation  
5. Corrects grammatical or morphological errors  
6. Searches for meaning of words  
7. Tries several ways of forming phrases  
8. Analyzes grammatical structures  
9. Evaluates language use

IV. Showing emotion and feeling for others

1. Complains  
2. Jokes  
3. Reassures partner  
4. Apologizes  
5. Shows excitement or surprise  
6. Warns or reminds partner

Table 10 compares the three programs with respect to each category.

It can be seen in Table 10 that well over half of the discussion acts fell into the categories of managing strategies for accomplishing tasks (IB), inquiring (IIA), and responding (IIB). The large number of acts in category IB is interesting in that the subcategories here are high level learning strategies (decision-making, generalizing, analyzing by cause/effect, suggesting, evaluating, etc.), all important in academic work. Acts in inquiring and responding show the collaborative nature of pair discussion: through these acts subjects contributed their own knowledge and experience to the accomplishment of tasks.
Table 10
Talk in the Present Study Classified into Six Major Categories
Derived from Long et al.'s Scheme (Average Acts/Min) — all 3 groups combined.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>1.07</td>
<td>0.65</td>
<td>1.25</td>
</tr>
<tr>
<td>Managing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mechanics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IB</td>
<td>2.27</td>
<td>1.27</td>
<td>1.50</td>
</tr>
<tr>
<td>Managing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>strategies for accomplishing tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIA</td>
<td>1.23</td>
<td>1.54</td>
<td>1.17</td>
</tr>
<tr>
<td>Inquiring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIB</td>
<td>2.29</td>
<td>1.69</td>
<td>1.81</td>
</tr>
<tr>
<td>Responding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>0.04</td>
<td>0.69</td>
<td>0.73</td>
</tr>
<tr>
<td>Showing concern for language form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>0.06</td>
<td>0.12</td>
<td>0.16</td>
</tr>
<tr>
<td>Expressing emotion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The data in category III, showing concern for language form, are slightly different from those shown in Table 9 category D2 (Discuss Language) because a few acts assigned to D2 under the modified Piper's scheme were better classified under some other subcategories (e.g., clarification) under the modified Long et al.'s scheme. However, the discrepancy is minor, and the general pattern is the same with both schemes—less concern for language form was shown in "Lemonade Stand" than in "Articles" and "Eliza." The contrast between "Lemonade Stand"
and "Articles" is not surprising: "Lemonade Stand" is a business-oriented program which requires major attention to problem-solving and calculation, while "Articles" is a language-oriented program in which subjects would naturally tend to discuss language. However, it is interesting that "Eliza" elicited almost as much discussion of language as "Articles" did. This point is taken up in the last section of this chapter.

To determine statistically whether frequency of use of function varies with program in this study, the REPEAT and MANAGE data from Table 7 and the data in the six categories from Table 10 were analyzed by means of the SAS (Statistical Analysis System) General Linear Model program. (The data file for this analysis is shown in Appendix E.) A separate analysis of variance (ANOVA) was performed for each of the eight categories of acts. The model used for the ANOVA accounted for differences in pairs as blocking effects. The model also included program effects which were assumed to be additive with respect to the pair effects. The model can be written in symbols as:

\[ Y_{ij} = \mu + P_i + L_j + E_{ij} \]

where
- \( P_i \) = the effect for the i-th pair
- \( L_j \) = the effect for j-th program
- \( \mu \) = the overall mean response
- \( E_{ij} \) = a random error
- \( Y_{ij} \) = the observed response for the i-th pair and j-th program.

The mean square error from the ANOVA was used to compute the standard
error for the program means. The results of the analysis are summarized in Table 11.

As shown in Table 11, there were statistically significant program differences in several categories: R (repeating), M (managing computer/task), IB (managing strategies for accomplishing tasks) and III (showing concern for language form). (Many of these differences have been noted in discussion of tables presented earlier.) "Lemonade Stand" elicited far less repetition than "Articles" and "Eliza." "Eliza" elicited significantly less computer/task management than the other two programs, possibly because the "Eliza" format accepts input in any form, whereas the other two programs are stricter in this respect. "Lemonade Stand" elicited significantly more acts managing strategies for accomplishing tasks than either of the other two programs, perhaps because of its problem-solving nature. Finally, "Lemonade Stand" elicited significantly fewer acts indicating concern for language form than the other two programs. As noted earlier, this may be because in "Lemonade Stand" subjects' attention was drawn to the business problems posed in the simulation rather than to the language they were using.
Table 11
Results of Statistical Analysis for Eight Categories of Acts

<table>
<thead>
<tr>
<th>Categories of acts</th>
<th>Averages acts/min</th>
<th>Standard errors for means</th>
<th>Level of significance for t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>La</td>
<td>Lb</td>
<td>Ea</td>
</tr>
<tr>
<td>R</td>
<td>1.43</td>
<td>3.05</td>
<td>3.75</td>
</tr>
<tr>
<td>M</td>
<td>0.71</td>
<td>0.11</td>
<td>0.70</td>
</tr>
<tr>
<td>IA</td>
<td>1.07</td>
<td>0.65</td>
<td>1.25</td>
</tr>
<tr>
<td>IB</td>
<td>2.27</td>
<td>1.27</td>
<td>1.50</td>
</tr>
<tr>
<td>IIA</td>
<td>1.23</td>
<td>1.54</td>
<td>1.27</td>
</tr>
<tr>
<td>IIB</td>
<td>2.27</td>
<td>1.69</td>
<td>1.81</td>
</tr>
<tr>
<td>III</td>
<td>0.04</td>
<td>0.69</td>
<td>0.73</td>
</tr>
<tr>
<td>IV</td>
<td>0.06</td>
<td>0.12</td>
<td>0.16</td>
</tr>
</tbody>
</table>

a L, E, and A represent "Lemonade Stand," "Eliza," and "Articles" respectively.

b The last three columns report the significance level for t-tests for differences between mean responses for two programs. For example, the value of the t-statistic for the difference in the mean value of acts per minute in category R for programs "Articles" and "Lemonade Stand" is

\[
t = \frac{3.75 - 1.43}{\sqrt{2 \times 0.49}} = 3.35
\]

And the probability (|t| > 3.35) (4 degrees of freedom)

R: Repeating
M: Managing computer/task
IA: Managing mechanics of discussion
IB: Managing strategies for accomplishing tasks
IIA: Inquiring
IIB: Responding
III: Showing concern for language form
IV: Showing emotion and feeling for others
* Indicates probability ≤ .05
Two other measures used by Long et al. were also used here to illustrate the differences among programs: quantity and quality of function. In Long et al.'s study, quantity of function was the total number of functions subjects used, while quality of function indicated the variety of functions subjects used. Here, since subjects spent different amounts of time on the various programs, quantity of function was expressed as functions per minute and calculated by dividing the total number of functions by the total time for each transcript. Quality of function is represented as the total number of different functions in each transcript. A third measure—average length of function—was calculated by dividing the total number of words by the total number of acts in each transcript. For all measures, averages for the three pairs are reported. Table 12 compares the three programs with respect to quantity, quality, and length of language function.

With respect to quantity and length of function, "Lemonade Stand" was the highest of the three programs. However, with respect to quality of function, "Lemonade Stand" was the lowest.
Table 12

Quantity, Quality, and Length of Language Function

(Average for 3 runs)

<table>
<thead>
<tr>
<th>Program</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of language function</td>
<td>6.96</td>
<td>5.96</td>
<td>6.62</td>
</tr>
<tr>
<td>(average acts/min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of language function</td>
<td>28.67</td>
<td>31.33</td>
<td>32.66</td>
</tr>
<tr>
<td>(average of function used)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average length of function</td>
<td>5.65</td>
<td>4.51</td>
<td>4.04</td>
</tr>
<tr>
<td>(words/act)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary of numerical comparison

In the previous sections, a number of comparisons were made with respect to the three programs used in this study. These are summarized in Table 13. In preparing the summary, certain criteria for evaluating computer talk were assumed. In general, these criteria reflect the emphasis in this activity on communication rather than correctness and simple repetition of form. The best program elicits

a. the most talk

b. the most complex talk (Length of turn and the number of connectors are the best indicators of complexity of talk in this study.)

c. the least self-correction
d. the least repetition and concern for language form but the largest number of language functions in other categories.
e. the most functions used
f. the largest variety of functions
g. the longest functions

Pluses and minuses indicate the best and worst program in each category according to these criteria.

From Table 13, it is evident that "Lemonade Stand" stimulated the most talk, the most complex language (as indicated by length of function and number of connectors used), the least repetition and show of concern for language form, the most discussion in the categories of computer/task management and management of strategies for accomplishing tasks, and the most and longest functions. These facts suggest that "Lemonade Stand" was the best program in terms of developing communicative competence. "Articles" produced the highest quality (variety) of functions. From the numerical comparison, "Eliza" appears to be the worst program, but it has strengths which cannot be represented quantitatively, as discussed in the next section.
Table 13
Summary of Selected Program Differences

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Lemonade Stand</th>
<th>Eliza</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity of talk</strong></td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Complexity of talk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. frequency of turn-taking</td>
<td></td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2. length of turn</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. number of connector used</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Rate of self-correction</strong></td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Stand and Articles are the same in this category.

**Range of function**

1. **R**: Repeating + -
2. **M**: Managing computer/tasks + -
3. **IB**: Managing strategies for accomplishing tasks + -
4. **III**: Showing concern for language form + -

| **Quantity of function**                     | +              | -     | -        |
| **Quality of function**                      | -              |       | +        |
| **Length of function**                       | +              | -     | -        |

Qualitative Description of the Language in Computer Talk

In this section, a number of qualitative comments about the language stimulated by each program are provided to complement the quantitative evaluation above.
Lemonade Stand

The design of "Lemonade Stand" caused subjects to test hypotheses, as in the following example:

A: Another time we should increase both the advertisement and the number of cups, to check if the number of sales would link to nine [the number of glasses of lemonade they tried before] or not.
B: to sell more?
A: Yes.

Subjects also tried out different strategies to discover the outcomes: producing more or fewer glasses of lemonade, using or not using advertisements, and lowering or raising the price of lemonade. As they moved along, they found an extra factor, weather, affecting their business, which led to more discussion. On the whole, this appeared to be a very motivating program. However, one pair seemed to be fascinated by the speed of the computer's responses; therefore, they proceeded so fast that they did not discuss nor negotiate but merely attended to the results.

Another interesting reaction to the program was noted with the Malaysian subject, who tended to recite every word on the screen and often restated the situation for his partner. This may have been a culturally conditioned response: as noted by Tong-Fredericks, "echoing is a prominent feature of Malaysian informal speech in the prevailing sociocultural context and it can be interpreted as showing a willingness to accommodate." (1984, 140)
"Eliza" was a confusing program for subjects even with the instruction sheet which was designed to remedy this problem. One reason may be the non-directive inquiring (probing) approach taken in this program, which may be very unfamiliar to ESL students. Under this inquiring approach, the success of "Eliza" in stimulating interaction depends to some extent on the subjects' willingness to provide information. Another problem with "Eliza" is that since the computer can not really understand students' responses and "answers" only by repeating key words typed in by subjects, it sometimes displays "funny" answers such as "Why are you concerned whether you am interested?" One pair ignored such errors in syntax and semantics and tried to continue the exchange, but the other two pairs suspected the computer's responses and even teased the computer, commenting: "You are stupid," + "Your mind is limited."

The other reason that "Eliza" was confusing for the subjects is that there are some difficult words used in the program script, in particular, "elucidate" and "elaborate." When these words appeared on the screen, they usually generated discussion of meaning. Thus, "Eliza" elicited almost as many acts in the "discuss language" and "showing concern for language form" categories as "Articles" (see Tables 9 and 10).

In spite of the difficulties with "Eliza," most subjects still enjoyed working on it. They laughed a lot at the cute responses like "We are discussing you--not me." and liked the general give-and-take
Articles

Because they did not attend to the instructions in "Articles," some pairs worked on problems other than article errors, which elicited some interesting discussion. For example, they tried out several quantifiers to see how they worked (quite a large/a great deal/a lot of/many), discussed whether adjective or noun form (Asian/Asia) was appropriate, and so on. Since the rules for article usage are very complex, subjects also discussed grammatical concepts such as count/noncount, generic/specific, etc. in evaluating the correctness of the sentences presented. The program gave users two chances to provide answers; if their responses were not acceptable, it supplied the correct answer. Because of this fast feedback, sometimes subjects simply guessed at the answers intuitively without much discussion or negotiation.

Summary

In general, all three programs held the subjects' interest (at least for thirty minutes). All three pairs concentrated on the tasks presented by the programs and tried to do what was required.

Overall, "Lemonade Stand" seemed to be the best program in that it elicited the most talk and provided the most practice of language functions. However, if criteria other than those assumed here are used, e.g., if language form is important at a certain learning stage, this program may not be as helpful as the other two.
The strength of "Articles" probably lies in the fact that it prompted consideration and discussion of language form. Interestingly, both the approach "Articles" takes—drill and practice—and the discussion showing concern with correctness it elicited are in accord with the older approaches in second language pedagogy. Nevertheless, this type of program elicited the largest variety of functions, which indicates its strength as a generator of communicative activities.

From the numerical comparison, "Eliza" seemed to be the worst program in terms of the indicators used here. However, the qualitative description suggests that it also has certain strengths: it is enjoyable and it at least has the potential of generating free discussion.
CHAPTER V
CONCLUSIONS AND IMPLICATIONS

Conclusions

The purpose of this study was to investigate and evaluate what happens when three computer programs are used to stimulate discussion between pairs of adult ESL students. The results are summarized at the end of the preceding chapter. Following are some of the conclusions to be drawn from the findings of this study:

1. Computer programs seemed to elicit less talk than other oral communication activities without computers because of the time required to read screen displays and type in responses.

2. As in Piper's study (1985) of computer talk, subjects in this study used relatively simple language and self-corrected infrequently. However, in light of current theories of language learning, these shortcomings may not be very important as long as real communication is taking place.

3. Subjects carried out much more discussion than repetition and used a wide range of functions (58 categories according to the modified Long's et al.'s (1976) scheme); therefore, computer talk would seem useful as a communicative activity.

4. As in previous studies, the relative frequency of different functions in this study varied with computer program because of the nature of the tasks they did and did not require subjects to do.
Implications

Because this was a small scale exploratory study with only six students and three computer programs, the results may not be completely generalizable. For example, students with different cultural or educational backgrounds may perform differently from the subjects in this study. As mentioned before, Malaysian subject in this study echoed and restated more than other subjects. Other culturally related characteristics might be observed with students from different backgrounds. Additionally, the context in which the computer is used should be taken into account. Different results may be obtained in a classroom setting.

However, in spite of the limitations of this study, the results are at least suggestive. First, this study indicates that computer programs can create a communicative environment for collaborative interaction and meaningful discussion. As noted earlier, existing courseware does not meet the demands of today's communicatively oriented language classrooms. Programs such as "Eliza" and "Lemonade Stand," originally non-ESL materials, as well as more traditional grammar lessons, can remedy this situation in computer talk.

Second, by carefully selecting the programs students will work with and tailoring instructions for their use, teachers can encourage different kinds of computer talk to meet the needs of various instructional settings. As noted previously, a problem-solving simulation like "Lemonade Stand" seems to elicit the most discussion, probably because it is a typical two-way task requiring cooperation.
between the program users. Thus, in order to have students gain more practice in listening and speaking, a "Lemonade Stand"-type program is a good suggestion. A conversation program like "Eliza" requires students to be somewhat tolerant of ambiguity and willing to talk. However, one of its strengths may be that it can be adapted for different levels of learners. For instance, for lower level students, teachers might assign specific topics for discussion, whereas for higher level students, open-ended communication could be encouraged. Interestingly, one way of using "Eliza" is to ask students to discover how the program operates. Detailed suggestions for using "Eliza" are given in Stevens (1986). A grammar program like "Articles" can be used successfully to generate talk, provided the grammar rules are not clear-cut so that subjects have to negotiate with each other to find the answers. Some learners may prefer this type of program over non-ESL programs because they see it more directly meeting their needs. Therefore, the selection of computer programs and design of activity depend on teachers' various goals and needs.

Third, this study may help classroom teachers to make a quick evaluation of the effectiveness of the computer programs they assign. By observing students as they are working, they can estimate the amount of talk generated; they may also get a rough idea of the complexity of talk and the kinds of functions students are using.

Lastly, this study suggests that students' personalities and cognitive styles need to be taken into account in assigning computer work. For example, if learners are too impulsive or impatient to think
about their responses, the computer's fast feedback may not be beneficial. Perhaps adding some features which motivate students to work more carefully, e.g., asking them to compete with each other or requiring them to achieve a certain score in order to proceed to the next unit, might help these program users. In addition, teachers should probably not use "Eliza"-type programs for learners with little tolerance of ambiguity without checking to see that the program script is appropriate in topic, vocabulary, etc., since computer responses from this type of program can frustrate learners.

Suggestions for Future Research

Since few studies have dealt with using computer programs as stimuli for group discussion, there is still a need for more research in this area. The present study should be replicated with more subjects to discover whether the patterns noted here are observed with other learners. For coding, the final version of the modified Long et al.'s scheme under six headings is recommended because it captures the patterns of functions used in the various lessons without creating problems in differentiating over minute subcategories. For a less detailed analysis, Piper's original three-way classification or perhaps Piper's Repeat and Manage categories together with the six headings in the modified Long et al.'s scheme may be adequate. Another way to reduce the time employed in coding is to choose functions or structures important at certain learning stages and conduct a detailed analysis of these. For instance, questions and their functions or the structural
variations of requests might be selected for study.

This study also suggests some interesting issues for future researchers. First, how do different types of learners react to various kinds of computer programs? As noted in the present study, learner personalities and cognitive styles seem to influence their talk. More detailed studies in which the learning styles are related to talk elicited by various types of programs would be helpful in selecting the best programs for different students.

Second, are there unique characteristics, such as animated screen displays, instant feedback, and record-keeping capabilities, which encourage better talk than that elicited by non-computer small group activities? More and more people are becoming enthusiastic about using computers to stimulate talk in the second language, but too often they are attracted primarily by the novelty of this technology. Research is needed to show whether certain features of computer programs contribute to group discussion that is superior to that generated in non-computer activities. Findings can help program designers in planning CALL lessons to be used in small group work.

Third, what happens when this activity is carried out in monolingual groups? How much will students use their first language? What kinds of programs will require learners to speak the target language? The answers to these questions will shed some light on the use of this activity in English as a foreign language classrooms with homogeneous groups of learners.

It will be a long time before meaningful interaction between
computers and their users becomes practical in CALL lessons. Meanwhile, this study suggests one way to use computer programs to help second language learners communicate creatively and meaningfully. More research is also needed to refine the use of this activity in meeting the needs of individual students and to discover specific features inherent in computers which help second language learning.
REFERENCES


Green, Thomas. "Non-Software Use of Software in the ESL Classroom." Medium, 9, No. 3 (1984), 127-130.


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APPENDIX A

Instructional Sheet and Guidelines for Intervention

KEYBOARDING

TO DO THIS

to revise what you've typed in

ask computer to check your answer

alphabet and numbers

PRESS THIS KEY

DELETE

RETURN

use like typewriter's keyboard

COMPUTER PROGRAMS

In doing the 3 computer programs, try to solve all the questions with your partner. Discuss the questions in any languages as naturally as you can.

(1) Articles

1. In this program, look for any error of article usage in each sentence. If you find one, type in the correct WHOLE sentence. If not, press RETURN and go to next question.

2. There are five sentences in each section. After five questions, you will be asked to continue or not. Please go on until I tell you to stop.

3. Discuss each sentence with YOUR PARTNER and agree on an answer.

4. Try to solve all the questions with your partner first. Don't ask me questions during the process except when you really need to.

(2) Lemonade Stand

1. In this program, you will be asked to sell lemonade. To make as
much money as you can, you need to control the price of lemonade,
the cost of lemonade and the cost of advertising signs.

2. Enter only numbers in this program.

3. You and your partner SHARE ONE stand.

4. Discuss WITH YOUR PARTNER to try to solve all the questions
   first. Don't ask me questions during the process except when you
   really need to.

(3) Eliza

You are going to talk with the computer about some of your problems.
Make your responses reasonably long; ONE LINE is appropriate.

1. In your first answer (response) type in:

   "Yes, I feel lonely because I don't have friends." or
   "Yes, I feel depressed because I . . . ." or
   "Yes, I feel unhappy because I . . . ." or
   "I feel happy because . . . ." or
   any other similar topics.

2. After talking with the computer for a while, you can talk to the
   computer about any other topic you want if you do not like
   the original topic.

3. In doing 1 or 2, try to figure out how the computer can talk to
   you. Is it really as smart as human beings? Can it really
   understand you and answer your responses?

4. Discuss the answer with your partner and agree on an answer.
   Don't ask me questions during the process except when you really
   need to. Try to solve the questions by yourselves first.
Guidelines for Intervention

In collecting data, the investigator sits silently with the subjects.

1. If the subject is silent for more than 30 seconds, she can try to stimulate further talk.

2. If the subject goes too far astray from what the program asks them to do, she can explain the instructions again.

3. If the subject has questions about the meaning of words in this program, she will try not to answer them since searching for word meaning is an important part of computer talk.
APPENDIX B

Modified Long et al.'s Scheme (1976)

(A + indicates that the category was added to account for data in the present study but apparently not noted by Long et al. Numbering is not always consecutive because categories in which no acts were observed are not listed.)

A. Pedagogical Moves

P2. " focuses discussion.
P3. " summarizes and completes discussion.
P7. " extends a previous contribution of his own or others.
P8. " reformulates own or other's previous assertion.
P12 " asks for information.
P13 " asks for information about target language.
P14 " answers questions.
P15 " answers questions about target language.
P16 " asks for clarification.
P17 " clarifies.
+P18 " expresses confusion (lack of understanding).
+P19 " decides.
+P20 " rephrases.
+P22 " corrects spelling or punctuation.
+P23 " corrects grammatical or morphological errors.
+P24 " searches for word meaning.
+P25 " asks for more time to process tasks.
+P26 " expresses purpose.
+P27 " asks if partner understands.
+P28 " spells words out for typist.
+P29 " corrects wrong information about tasks.

B. Social skills

S1. Student competes for the floor. (assumes initiative)
S3. " completes other's unfinished utterance.
S4. " disagrees.
S5. " invites participation (asks for opinion).
S6. " agrees.
S7. " makes explicit reference to other's contribution.
S10 " jokes.
S13 " confirms.
+S14 " advises.
+S15 " insists on own answers or judgement.
+S17 " reassures partner ("Never mind.").
+S18 " asks for confirmation.
+S19 " apologizes. (for typing errors, to the computer, etc.)
+S21 " asks for agreement.
C. Rhetorical Acts

R1. Student predicts.
R2. hypothesizes (tries out various permutations).
R3. makes an observation.
R6. states generalization (e.g., language rules).
R7. defines.
R9. expresses cause and effect relationship.
R10 exemplifies.
R14 concludes.
+R15 suggests a strategy or an answer.
+R16 does not understand or believe computer's response or answer.
+R17 explains the reason of own decision/suggestion.
+R18 evaluates previous or possible course of action, content of tasks.
+R19 evaluates language.
+R20 expresses condition.
+R21 shows uncertainty.
+R22 shows excitement or surprise by exclamation.
+R23 warns or reminds.
+R24 questions.
+R25 analyzes.
+R26 evaluates computer's responses.
APPENDIX C

Transcript and Sample Coding

(* means long pauses)
(Only D's in the modified Piper's scheme were coded by the modified Long et al.'s scheme. Only one category from the modified Long et al.'s scheme was selected for each D in Piper's scheme. In cases where more than one category seemed appropriate, the act was classified according to its primary functions.)

<table>
<thead>
<tr>
<th>Eliza</th>
<th>Modified Piper's scheme</th>
<th>Modified Long et al.'s scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>M: May I help you?</td>
<td>R1</td>
<td></td>
</tr>
<tr>
<td>R: Yes.</td>
<td>D1</td>
<td>P14</td>
</tr>
<tr>
<td>M: Yes.</td>
<td>R2</td>
<td></td>
</tr>
<tr>
<td>R: You seem quite positive. Sure, yeah.</td>
<td>R1 D1</td>
<td>S6</td>
</tr>
</tbody>
</table>

(M2: You need to give the computer some information instead of yes, sure, etc.)

| M: Which one? How to say? | D1 | P12 |
| R: What does that suggest to you? What's mean by that? | R1 D2 | P13 |
| M: We can give any kind of answer. | D1 | R15 |
| R: You can answer. | D1 | S5 |
| M: I'll try this one. How about you? I feel, yes, I feel, I feel lonely because I don't have friends. | D1 R2 | S5 |
| R: OK. | D1 | S6 |
| M: OK? (after they've seen screen display) * OK. | D1 D1 | S18 R14 |
| R: Because, don't have | R3 | |
| M: have | R2 | |
R: friends (laughed) OK. Is that the real reason? * Yes.
M: Yes?
R: Since coming here . . . Since coming here, *
M: Since coming here, I haven't, haven't any . . .
R: any friend, probably we have wrong stop
M: Probably what?
R: OK. It's OK. What? Is that the real reason?
M: What's wrong? Ah! Yeah. I don't understand. Yeah. have
R: What, What? e That's right. This one. Now, f-e, e, e, n, n
M: *
R: So, I see. What? We have wrong conversation? OK.
M: Is this possible to, to give to begin, to any question to here.
R: Why not we change the topic? Since this topic is quite, quite difficult. * See here, (point to Instruction Sheet) talking with the computer for a while, you can talk to the computer about any other topic you want. Shall we change now?
M: Yeah.
R: OK. Why not we change the topic?
M: How?
R: Type it there. I want to change the topic 'cause I didn't like that.

M: change?

R: Change the topic. What would it mean? OK. OK. Answer. Come on.

M: We ... We want ... to you about

R: English class

M: English, English class?

R: about our

M: our, English

R: class (laughed) We are discussing you—not me. Say, sorry computer. OK. We want to change. We want to talk about our English.

M: * talk to?

R: No, no, don't put you, only talk about

M: talk

R: OK. about. How is it respond? I'm not sure I understand you fully.

M: Unnn.

R: OK. What we mean * What, what, what we mean is that.

(M2: What do you mean by English class?)
APPENDIX D

Modified Long et al.'s Scheme (1976) under Six Categories

Scheme Categories and Examples

Categories

I. Managing discussion

A. Managing mechanics of discussion

1. Focuses discussion
   (Subjects were talking about prepositions but got sidetracked on another topic.)
   A: Yeah, sure. I thinking about I ran out of idea.
   B: ran out of idea?
   A: preposition is . . .
   B: important in writing

2. Completes/ends discussion
   That's the way it is. (after they saw computer response, "I see.")

3. Extends previous contribution
   A: no article?
   B: I have, please press RETURN.
   A: Press . . . OK. no article, we can try . . .

4. Rephrases
   A: a lot of words?
   B: Or many words.

5. Request more time to think
   Just one moment.

6. Competes for floor
   I'll try a different one.
   (takes over from dominant partner)

7. Completes partner's unfinished utterance
   A: Yeah, 'cause if we try to respond the question, the computer gave us different type of . . .
   B: answer

8. Insists on own view
   A: was hold (a suggestion)
   B: No, that's not correct.
   A: was hold, not held
9. Suggests an (another) answer (local changes in displayed sentences, number, words, etc.)

(On screen in "Articles": "Exercise 1. I have learned quite large number of words.")

I have already learned . . . how about that?

10. Expresses uncertainty about how to proceed

I don't know what's the right answer. (after discussion of a sentence in "Articles")

B. Managing strategies for tasks

1. Makes a decision

(After discussion of the correct answer)

Now type in the correct answer.

A cat is an useful animal.

2. Expresses purpose

OK. Maybe we can decrease the, the price in order to attract people to buy lemonade.

3. Invites participation

You can type.

4. Advises

(Subjects typed in a correct answer but the computer regarded it as wrong. They thought there was a mistake in their answer and decided to try again.)

Try to take care of typing.

5. States generalization

We did that before. As many cases [the computer didn't accept our correct answers.]

6. Expresses cause/effect

I think only have . . . have a healthful 'cause the other one was strange.

7. Draws logical conclusions

the cost of lemonade is 2 cents and because of advertisement, it's 0.4. So the [price should be more than 2.4 cents.]

8. Suggests a (another) strategy

Another time we should increase both the advertisement and the number of cups to check if the number of sales would link to 9 or not.
9. Evaluates previous course of action or computer's response
   He became the fastest . . . ours is correct. OK, go ahead.
10. Predicts/evaluates possible course of action
    What is, your opinion, about, U. S. A.? He'll [the computer]
    ask you why you ask this.

II. Establishing facts needed to perform task

A. Inquiring

1. Asks for information
   Which word is wrong?
2. Asks for clarification/repetition
   A: Don't elucidate.
   B: Don't what?
   A: Or don't try to avoid this question.
3. Expresses lack of understanding about facts
   I can't understand this sentence.
4. Asks if partner understands
   In one dollar we can produce, 50 glasses. Can you get it?
5. Asks for partner's opinion/suggestion
   What do you think?
6. Asks for confirmation
   A: I don't know what's the right answer.
   B: quite a large
   A: quite a large?
7. Asks for agreement
   We spent $1.80 on, on lemonade, OK?

B. Responding

1. Expresses understanding
   A: You have to say to the computer it's not your country. It's
   my country.
   B: I know.
2. Answers questions
   A: What's the weather today?
   B: I think it's sunny.
3. Clarifies
   A: Think about something better.
   B: What?
4. Corrects partner's misunderstanding
   A: Another topic.
   A: 2 dollars yeah. But the profit is five . . .
   B: seven-fifty
   A: five-fifty

5. Agrees
   A: The cat is useful animal.
   B: OK. OK. Useful

6. Disagrees
   No, that's not correct.

7. Confirms
   A: quite a large
   B: quite a large?
   A: Yes.

8. Shows (sudden) awareness of situation
   A-ha, that's an example.

9. Responds to screen or interprets computer's response
   (In response to profit report on screen)
   10 advertisement, 30 glasses, 30 .
   glasses, cents. Only 6 were sold.

10 Exemplifies

11 Shows lack of belief (of computer's response)
   He became the fastest bird. We have done this. (student had typed in the same answer before but the computer did not regard it as correct)

12 Questions partner's suggestion
   A: Unn. 5 cents, each glass, 5, 3, 3.
   B: It's enough?

III. Showing concern for language form

1. Asks for information about target language
   A: What is banquet?

2. Answers questions about target language
   B: official dinner

3. Spells words for typist
   p-h-i-l-o-s-o-p-h-y, ph-i, philosophy, ph-i-lo-so, so, so

4. Corrects spelling or punctuation
   A: Unn. I, have, what?
   B: learned, a large, no, no, n, e
Yeah, yeah. How do you know to understand? No, how do you understand?

We want to show you . . . . I can't think any other word.

OK. Singapore, the small, smallest, is the smallest.

But I think the flock means the class. He became fastest bird.

I have a poor health but health is uncountable noun.

A: [The computer] should say what's wrong with this. 
B: before it repeats many times.

You should know this one. 
Japan is a advanced country . . . 
(to a Japanese student)

Never mind because in this case, we profit . . . zero? Never mind. We didn't lose this time. 
(Reads from computer)

We are discussing you--not me. 
Say, sorry computer. OK. We want to change.

Oh! Good.

It's the last chance we try.

became, the, flock, no, c.
APPENDIX E

Data File Input for Statistical Computation

<table>
<thead>
<tr>
<th>Observation Programs</th>
<th>Pairs</th>
<th>R</th>
<th>M</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>D6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LS</td>
<td>0.93</td>
<td>0.42</td>
<td>0.74</td>
<td>2.56</td>
<td>0.98</td>
<td>2.00</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>2</td>
<td>Eliza</td>
<td>0.95</td>
<td>0.10</td>
<td>0.50</td>
<td>0.85</td>
<td>1.76</td>
<td>1.56</td>
<td>0.50</td>
<td>0.10</td>
</tr>
<tr>
<td>3</td>
<td>Articles</td>
<td>3.25</td>
<td>0.60</td>
<td>1.35</td>
<td>1.35</td>
<td>1.10</td>
<td>1.80</td>
<td>0.35</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>LS</td>
<td>1.49</td>
<td>0.65</td>
<td>1.56</td>
<td>1.67</td>
<td>1.27</td>
<td>2.21</td>
<td>0.00</td>
<td>0.04</td>
</tr>
<tr>
<td>5</td>
<td>Eliza</td>
<td>3.99</td>
<td>0.13</td>
<td>0.67</td>
<td>1.08</td>
<td>1.03</td>
<td>1.97</td>
<td>0.85</td>
<td>0.00</td>
</tr>
<tr>
<td>6</td>
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LS means "Lemonade Stand."