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AUTHOR Robinson, Gail; And Others
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ABSTRACT

A comparison of the effectiveness of different ways to organize instructional materials and different strategies for error feedback used the computer as a research tool and took as subjects first-year junior high school Spanish students, who were randomly assigned to experimental and control groups. To investigate materials organization, computer exercises were designed in Spanish to measure the effect on achievement of such factors as integrated context vs. discrete items, personally meaningful material vs. impersonal material, student choice of background content vs. program choice, and the effect of problem-solving activities on the acquisition of language skills. To compare error feedback methods, the study considered the relative effectiveness of student-controlled help vs. program-controlled error correction, types of error repetition, and the role of student discovery in the error correction process. Post achievement test gain scores were consistently in favor of the experimental group. The findings and their implications for instructional materials design, computer-assisted instruction, and testing are discussed. Appendixes include questionnaires, materials descriptions, sample achievement tests, student interest questionnaire, transcript of taped interviews, and programming strategies. (Author/MSE)

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COMPUTER-ASSISTED-INSTRUCTION IN FOREIGN LANGUAGE EDUCATION
a comparison of the effectiveness of different methodologies and different forms of error correction

ABSTRACT

This study was funded by a major grant from the International Research and Studies Division, U.S. Department of Education, contract number G008402275, and was completed during the 1984-85 academic year. The field study was conducted with first-year Spanish students at Montera Junior High School, Oakland, California in the spring of 1985. In this project, the computer was used as a research tool with which to compare the effectiveness of 1) different ways of organizing instructional material, and 2) different strategies for error feedback. For the former, computer exercises in Spanish were designed to measure the effect on achievement of such factors as integrated context vs. discrete items, personally meaningful vs. impersonal material, student choice of background content vs. program choice, and the effect of problem-solving activities on the acquisition of language skills. For the comparison of error feedback, the study considered the relative effectiveness of student-controlled help vs. program-controlled error correction, types of error repetition, and the role of student discovery in the error correction process, (eg. location of error vs. commentary as in hints, implicit vs. explicit feedback). The experimental group significantly outperformed the control group on the cumulative post achievement test gain scores. These scores are consistently in favor of the experimental group in absolute terms and when scores were mediated by prior knowledge, aptitude, attitudes and abilities, giving strong evidence in favor of the experimental hypotheses and their treatments.

search Division, P.O. Box 9968, Mills College, Oakland, Ca. 94613, U.S.A. Phone: (415)547-330

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PART ONE: PURPOSE OF THE RESEARCH

1 THE ROLE OF COMPUTER-ASSISTED INSTRUCTION (CAI) IN FOREIGN LANGUAGE EDUCATION: STATE OF THE ART

1.1 The computer revolution

The use of computers in the nation's schools is growing at a rapid rate, yet it is not without its problems. In a manner that recalls the recent history of the language lab, we find that the development of hardware--the machines themselves--far outstrips the production of quality software or "courseware"--the programs needed to enable the computers to "teach". Much courseware are actually "electronic workbooks": text-like drill-and-practice activities that are actually little more than an expensive way to present a text, at considerable cost to the educational consumer can scarcely justify the considerable investment involved.

At this early stage in the use of computers in language teaching, educators have an opportunity to take a long, hard look at what is happening and help determine the direction it will take. If the capabilities offered by this new medium are applied in accordance with sound pedagogical principles, much good can be accomplished; if used in a hurried and unthinking fashion, much harm can be done:

> "It is imperative that computers enter our educational system in an orderly, intelligent manner, in contrast to our experience with television" (Braun 1980)

1.2 State of the research

It is probably much too early to expect any definitive findings on the effectiveness of CAI materials. To date, few studies have been carried out, and the little research which is available is conflicting. Braun (1980) claims that student attrition is decreased, and that performance on certain exams is improved and/or learning time is saved when instruction is supplemented with CAI. Hawkins (1970), in a study which antedates the microcomputer revolution, claims that CAI has no consistent positive or negative effects on student achievement or attrition. Edwards, et al. (1975) have shown that CAI is no more and no less effective compared with other nontraditional methods of instruction, e.g. tutoring, language lab, and filmstrips. Frenzel (1980) states that CAI "has never demonstrated any superiority over other teaching techniques."

The conflicting results may be due in part to the nature of the questions asked. In setting out to compare the effectiveness of CAI and classroom instruction, they have failed to consider

Text Instructions: Make a sentence in Spanish in which you:

1. Ask a classmate if he or she likes gifts.

2. Say that the class is interesting.

3. Tell two of your friends that they are interesting.
(ibid.)

None of the above exercises would be considered authentic speech from a native speaker's point of view. "People simply do not communicate in disconnected sentences or words. We read material on a particular topic. We hear speech within a particular context, if only for the duration of a sentence or two. And, with the notable exception of some foreign language classes, we write things pertaining to a particular context" (Robinson, 1985, p. 36).

Even when the emphasis is on linguistic competence through the learning of particular forms or discrete lexical items, research has shown that memory for discrete items is also improved by providing an integrated context (ibid., p. 37). For example, Bower and Clark (1969) presented two groups of subjects with lists of ten totally unrelated nouns which they were told to memorize. The experimental group was instructed to learn the words in each list by creating a sentence or small story which contained all the words in a single context, however forced. The following is an example of one subject's response (the key words to be learned are given in upper case):

> "A VEGETABLE can be a useful INSTRUMENT for a COLLEGE student. A carrot can be a NAIL for your FENCE or BASIN. But a MERCHANT of the QUEEN would SCALE that fence and feed the carrot to a GOAT." (Bower and Clark, 1969).

The control group was simply told to memorize the list of words. On a delayed recall test, "Subjects who had made up stories were able to recall correctly 94% of the words from all the lists, as compared with only 14% for the control subjects" (ibid.). The student-generated integrated context clearly improved recall of semantically discrete items.

The examples throughout this section suggest the hypothesis that items presented within an integrated and meaningful context will be remembered over time and learned more efficiently than those presented discretely. In the present study, this hypothesis is examined in two different ways: (1) comparing material which is presented in an integrated context with material presented in unrelated sentences, and (2) comparing practice based on comprehension of the sentences with practice in manipulating the form (see Appendix B, Day 4 and Day 7, respectively).

2 THEORETICAL FRAMEWORK: ACQUISITION VS. LEARNING, COMMUNICATIVE COMPETENCE AND FUNCTIONAL/NOTIONAL APPROACHES TO SECOND LANGUAGE LEARNING

One of the major trends in pedagogy reflected in second language literature during the past decade has been the shift from emphasis on the structure and form of language to the meaning conveyed through it (e.g. Krashen, 1979, Rivers 1972, Robinson 1978, 1981, Savignon 1972, Stevick 1976, Wilkins 1976). This distinction between form-centered practice and meaning-centered practice through authentic communication has been interpreted through a variety of somewhat overlapping theoretical frameworks, referred to variously as the distinction between linguistic vs. communicative competence, learning vs. acquisition and grammatical vs. notional/functional syllabuses:

> "Linguistic competence is primarily manifested in the ability to produce grammatically acceptable (i.e. "correct") sentences. The concept of communicative competence is far less clear cut... Within the United States at least, the recent concern with communicative competence stems largely from sociolinguists who feel that a truly interesting study of language must include its functions in communicative context and the rules which determine social acceptability and appropriateness (e.g. Dell Hymes 1972)...From the pragmatic point of view, communicative competence is...viewed primarily as the ability to perform speech acts in such a way that they accomplish the outcomes intended by the speaker. Closely related to both the sociolinguistic and pragmatic views of communicative competence is the one rooted in the notional analysis of language (e.g. Mumby 1978): Communicative ability is viewed essentially as an ability to express formally notional categories required in specific communicative contexts." (Politzer 1982).

While approaches which focus on communicative competence, language acquisition, and functional/notional syllabuses differ on many levels, they share a common emphasis on meaning as opposed to form.

2.1 Problems with CAI in FL education in relation to this framework

As mentioned in section 1.2, there is some fear that CAI in foreign languages will "turn the clock back" to an earlier, more traditional era in language education. This fear may be partly due to the mistaken assumption that the computer is by its very nature predisposed to emphasis on form rather than emphasis on meaning. In actuality, the computer itself has no intrinsic pedagogical orientation, since this depends entirely on the program one puts into it. Thus CAI activities could just as well focus on meaning rather than form; activities could well be

organized around a notional approach rather than a grammatical approach; activities could be "acquisition" oriented rather than "learning" oriented (in Krashen's sense). It is possible that the goals of communicative competence might be facilitated through content which was culturally authentic as well as personally meaningful, and exercises in which dialogues branched according to the student's (speaker's) intention, as reflected in his/her choice of response. The challenge to foreign language educators lies in the creation of exercises which fit within the most promising theoretical frameworks, as evidenced by research. Perhaps our efforts in this regard have been weakened by the unthinking perpetuation of drills organized around the elements we have traditionally associated with "language drills." This tradition may in part be due to the "general though by no means necessary association of discrete point testing with the assessment of linguistic rather than communicative competence" (Politzer 1982). The influence of testing procedures and test content on the organization of instruction has been noted by Carroll, (1973), Robinson (1973) and Wilkins (1976).

The goal of developing exercises which fit within the prevalent theories of second language acquisition may be facilitated by taking a fresh look at general learning theory and memory research as it applies to communicative competence, informal acquisition and notional categorizations. Throughout the discussion that follows, a series of hypotheses will emerge that form the experimental bases of the research in the present study.

3 MEMORY AND MEANING

The relationship between the meaning of words and our ability to recall them has been the subject of a number of studies. Lindsay and Norman (1977), for example, have suggested that words are stored in memory according to semantic categories. Words and sentences which are presented together in the same category take less time to recall and are recalled more often than those presented across categories. Long-term memory appears to be organized on the basis of meaning rather than on verbatim wording or sentence structure (Sachs 1967). For this reason, it has long been claimed in the FL literature that speech which is authentic and meaningful will be recalled more accurately than speech which is not (e.g. Rivers 1964, Robinson 1981, Stevick 1976). As for CAI, Schaeffer (1979, 1981) reports a study in which students of beginning German at the United States Air Force Academy achieved greater results through CAI drill practice requiring them to know the meaning of the sentences than through structural CAI drill practice without reference to meaning.

Memory research supports these claims from several perspectives.

3.1 Memory and integrated context

As discussed in Section 2, emphasis on using speech which is both authentic and meaningful (in terms of the speaker's intention to communicate) is common to theories of communicative competence, informal acquisition and functional/notional categorizations. In contrast, Robinson (1985) has pointed out that disconnected items which lack any authentic meaning in this sense are common to FL textbook exercises and much of the FL courseware currently available (cf. for example, the courseware listed by Harrison, 1983). Without an integrated semantic context, authenticity of speech or naturalness of speech to serve a particular function can hardly be approached. Consider the examples below, extracted from Robinson 1985 (pp. 35-37). Students focusing on a structural point such as present tense verb endings in Spanish are frequently given a series of items such as:

Computer model:	(Ella y el)	vivir
(Answer)		viven
1.	(Nosotros)	comer

Similarly, for practice in English question formation, students are often asked to form a question from a disconnected array of sentences such as:

Computer model: The students are busy.
(Answer) Are they busy?

1. The dog is hungry.
   ========== (DASHER, Pusack 1982.)

To practice the plural form of Spanish nouns and adjectives, students are often asked to rewrite disconnected sentences:

Text model: El chico es guapo. (The boy is handsome.)

(Answer) Los chicos son guapos. (The boys are handsome.)

1. La montaña es alta. (The mountain is high.)
   ==========

2. El amigo es simpático. (His friend is
   ==========

Vocabulary items to be learned or reviewed are also frequently presented as a disconnected array of words. For example, some exercises instruct students to find the word most similar to the capitalized key word:

Computer model: Which word is most similar to QUIRK?

aura..evidence..mannerism..curve..move?

(Answer) mannerism

1. Which word is most similar to QUADRUPLE?
   increase..count..divide..identical..fourfold?
   ========== (ANALOGIES, Radio Shack)

Students are frequently asked to translate or rephrase disconnected sentences.

Text instructions: Rephrase sentences in the negative.

1. Me gusta jugar al tenis. (I like to play tennis.)

2. Yolanda es alta. (Yolanda is tall.)

3. Uds. son jóvenes. (You are young.)

(CHURROS Y CHOCOLATE, Scott Foresman)

Text Instructions: Make a sentence in Spanish in which you:

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2. Say that the class is interesting.

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(ibid.)

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3.2 Memory, personal reference and emotion

Other research has shown that memory is influenced by the nature of the meaning attributed to the words or sentences.

Self-Reference and "known other" reference.

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Self-Reference and "known other" reference.

In an experiment conducted by Smith (1970), students were asked to answer a series of yes/no questions which variously referred to themselves, known others, or were based on rhyme, definition or orthography. On a test of recall, words introduced in questions about themselves were recalled by subjects more than twice as often as words in questions about others or questions asking for definitions, or questions requiring decisions regarding whether words rhymed or were capitalized. Those questions referring to known others comprised the next largest group recalled. Robinson replicated the experiment informally in 1980, 1981 and 1982, and obtained identical results with varying populations, including university students, elementary school teachers and language teachers. In all of the experiments "word definitions" were the third and fourth smallest class of words to be recalled (Robinson, 1985).

These findings have important implications for second language teaching in view of the predominance of exercises containing material referring to anonymous others of the "Dick and Jane" type ("Jane is a secretary"). This research would suggest the hypothesis that exercises containing material referring to the learners themselves or to known others would be more effective than those referring to anonymous others. The present study examines this hypothesis, comparing parallel exercises referring to known others and anonymous others, respectively (see Appendix B, Day 2).

Emotion

Robinson (1981) cites studies showing that language acquisition is facilitated when the speaker/learner is personally involved with the messages conveyed through the second language. In these studies, materials were chosen and exercises were organized so as to elicit a subjective, emotional response from students. One of the hypotheses that emerged through these studies was that "emotional association may play as critical a role (and possibly a more critical one) in language associations and proficiency as do cognitive associations" (ibid.). These findings have been explained in terms of the "depth of processing" of the learners' messages (Stevick 1976, Lindsay and Norman 1977). Stevick's discussion of memory concludes that "other things being equal, the 'deeper' the source sentence within the student's personality, the more lasting value it has for learning the language." He suggests that this "depth factor" may be more important to language acquisition than "technique of formal or underlying linguistic analysis."

In his analysis of the motivational aspects of computer games, Malone (1981) suggests that the stimulation of emotion through fantasy constitutes one of three critical motivational components. He distinguishes between "extrinsic fantasies" that are not particularly related to the skill used in the game, and "intrinsic fantasies" which are skill-related. The notion of stimulating emotion through intrinsic fantasy has important implications for the development of FL exercises in which emotional stimulation is inherent in the particular intended linguistic goal(s).

Observations and research regarding the relationship between memory, emotional meanings and motivation suggest the hypothesis that material which stimulates emotion would be more effective than material which does not. This study compared exercises which isolated humor vs. non-humor from otherwise linguistically parallel material (see Appendix B, Day 5).

3.3 Memory as a product of comprehension

Clark and Clark (1977) suggest that "meaning" refers to the product of the listener's comprehension, i.e. the "gist" or general idea(s) that remain in memory from what the listener or reader has heard or read:

> "The listener's main goal in comprehension is to integrate the new information from assertions with what they already know, to find answers for questions, to develop plans for instructions, and so on" [sic].

This observation gives rise to several notions which are critical to the development of communicative competence. First, it is clear that comprehension involves the learner actively. Second, comprehension draws upon what the learner already knows. In the process of comprehension, listeners draw inferences and build global representations about what they hear.

--Global representations and the importance of prior knowledge: implications for student "menus" and dialogue branching--

Research shows that facts which fit within the listener's global representation of meaning are more easily remembered than those which do not. Global representation of meaning refers to the general context of what the listener already knows. De Villiers (1974) shows that sentences which are perceived as fitting within a story are better remembered than similar sentences which are perceived as disconnected. Similarly, a study by Bransford and Johnson (1973) shows that facts which do not fit within a particular representation of meaning are remembered less than those that do. Two groups of people were read the same passage. However, each group was given a different title for the passage before hearing it. One group was given the

title "Watching a Peace March from the Fortieth Floor." The other group was given the title, "A Space Trip to an Inhabited Planet." The passage was as follows (emphasis added):

> "The view was breathtaking. From the window one could see the crowd below. Everything looked extremely small from such a distance, but the colorful costumes could still be seen. Everyone seemed to be moving in one direction in an orderly fashion and there seemed to be little children as well as adults. The landing was gentle and luckily the atmosphere was such that no special suits had to be worn. At first there was a great deal of activity. Later, when the speeches started, the crowd quieted down. The man with the television camera took many shots of the setting and the crowd. Everyone was very friendly and seemed to be glad when the music started" (ibid.).

On a test of recall, the group given the title "Watching a Peace March..." was not able to recall the sentence about the landing, underlined above. However, the group given the title about the space trip was able to recall the sentence significantly more often. Within the context of a space trip, a "landing" fit in with subjects' prior knowledge; it did not, however, fit into the other group's assumptions concerning a "peace march."

Rubin (1981) also reports that students' prior knowledge of narrative structures influenced student ability to create a collective story from individual sentences, using the "strip story" technique of Gibson (1975). Similarly, prior knowledge should also affect acquisition and organization of new linguistic elements. For example, the concepts of the verbs SER and ESTAR or the past progressive tense in Spanish, or reading comprehension skills, should be more easily acquired if these structures are connected to students' prior knowledge base. A "menu" of topics could afford students the opportunity of choosing such a knowledge base. One could thus hypothesize that students who were able to choose from a "menu" of topics to provide the general context of instruction would achieve the goals of instruction more effectively (regardless of the particular goals) than those who were not able to make such a choice. The present study compared student choice of a story from a menu of topics vs. automatic story assignment, using otherwise parallel exercises (see Appendix B, Day 9).

--Drawing inference, guessing and problem solving: implications for the development of exercises and forms of error correction--

Research regarding the characteristics of good second language learners (Naiman, Frohlich and Stern 1975) and the strategies they use (Rubin 1981; Rubin and Thompson 1982) coincides with Clark and Clark's observation that comprehension

in any language requires the listener to actively draw inferences about the situation being described: "Good learners must modify their rules for both inductive and deductive reasoning on a continuous basis if they are to approach communicative competence" (Rubin 1981).

These conclusions have important implications for the presentation of material to be learned in language exercises as well as for forms of error feedback.

--Student discovery stategies for exercises--

If good learners actively draw inferences about what they read or hear, using both inductive and deductive reasoning, it would follow that exercises which require students to draw inferences through problem solving and guessing would encourage good learning stategies and improve linguistic as well as communicative competence more than exercises which did not require such active involvement. While a few CAI simulations in foreign languages do require guessing (e.g. "Mystery House"), most FL exercises do not. Even those that do often take the role of supplementary games which are isolated from the goals of instruction. In the present study, exercises which require students to describe pictures are compared with exercises which require students to solve problems. The same graphics, vocabulary and syntax are used (see Appendix B, Day 6b).

--Student discovery strategies for error feedback--

If good language learners actively draw inferences about what they read or hear, it would also follow that CAI which guided students in the discovery of their own errors would improve achievement more than forms of error feedback which merely gave students the correct answer and/or explained the correct answer automatically, following a student's incorrect trial or request for help.

Computer response to student errors has been referred to variously as "answer judging," "answer processing," and "error correction." Most existing foreign language CAI draws students' attention to errors in one or two of the following ways:

1. After the student's first and/or second incorrect trial, the computer responds: "wrong, try again."

2. After the student's first, second or third incorrect trial, the computer responds: "Wrong, [student's name]. The correct answer is ....."

3. After the student's first, second or third incorrect trial or the student's request for help, the computer responds with an explanation of the correct answer appears, regardless of the particular nature of the student's mistake.

4. After each student error up to three incorrect trials, the computer "locates" the error by underlining or deleting the incorrect characters which do not match with the correct response (e.g. Pusack's DASHER).

Only the fourth method of error correction stimulates active student discovery of their own errors. Unfortunately, this form of error correction is limited in two ways. First, simple location of error cannot distinguish between spelling errors, typos, grammatical problems, or comprehension problems, and hence it cannot guide students to discover why they made the error or how to remedy it. Second, there are certain kinds of errors, such as those due to the incorrect comprehension of lexical items, for which location of the error is meaningless. For example, suppose the instructions ask students, "Which word is similar to 'hot dog'?" The choices are: salad, sandwich, vegetable, dessert. A student marks "salad." For this student, locating the error gives no more clues than the rejoinder, "Wrong, try again."

Computers are capable of responding differently depending on the number and type of errors a student makes. Burton and Brown (1979) have suggested that "computer-based tutoring/coaching systems have the promise of enhancing the educational value of gaming environments by guiding a student's discovery learning." Computers are capable of "coaching" students who make mistakes by responding with hints which are graded in terms of type of error and number of incorrect trials a student makes on the same item.

EnBASIC by Compress is an augmented programming language which goes a step in this direction. Not only are errors located, they are marked up with a system of symbols designed to identify the type of error, e.g. number, gender, tense, word order, etc. Unfortunately, the symbols are quite complex and may be difficult for students to decipher.

Underwood and Bassein (1985) have recently developed a foreign language software package which uses a parsing routine to detect errors in student input. When errors are found, the program points them out (through inverse display or "highlighting"), at the same time that it gives the student a hint as to the type of error, usually in the form of a question. For example, if the student makes an error in gender agreement, the program will highlight the two mismatched forms and ask,

"Masculine or feminine?"

Other programs are beginning to appear which not only give graded hints in relation to misunderstood vocabulary, but also act as a tutorial in leading students to discover correct responses (cf. "French Achievement," "Spanish ConCluesion", "Mesaventures Culturelles").

The theory and research throughout this section suggests that the most beneficial forms of error feedback would stimulate production of inferences and guide students to DISCOVER the correct responses as well as the reasons for their errors, such as those discussed above. In the present study, forms of error feedback are developed and compared which isolate degrees of student discovery. These forms include: automatic disclosure of correct answers, correct answers with explanations, location of error only, and location of error with hints (see Appendix B, Day 3).

The notion of "implicit" vs. "explicit" correction is also related to the question of student discovery. Implicit error feedback may be signalled by a simple "pardon?" which implicitly asks for clarification. It may also include implicit modeling, rather than overt correction (cf. Terrell 1982). For example, suppose a native Spanish speaker responds to the English question, "How old are you?" with "I have 15 years." Whereas overt correction would involve modeling the correct answer itself ("No, I AM fifteen ..."), implicit modeling would embed the correct structure within a conversational response: "Oh, you say you are 15...[continuing with the conversation]...Do you have any brothers?" etc. Implicit feedback thus allows more opportunity for student discovery of errors. This study compares achievement on identical exercises which differ only in implicit vs. explicit feedback (see Appendix B, Day 10).

"Student control" versus "program control" is another related issue. It has frequently been pointed out that one of the advantages of CAI is that students may "control" their learning experience (cf. Smith et al. 1975; Merrill 1980; Soper 1982). At the same time, critics argue that one of the chief drawbacks of "classical" CAI is precisely that students do not control enough, that in fact the program controls them (cf. Papert 1980, Higgins and Johns 1984, Underwood 1984). In any case, the benefits of "student control" have yet to be confirmed by research.

Kadesch (1981) reports that of Keller's five elements in a Personalized System of Instruction (PSI), the notion of "self-pacing as opposed to instructor-imposed constraints on pacing was unimportant if not detrimental to learning." Other studies have shown that when students control the amount of instruction they receive, they often quit too soon and fail to learn what they should (Stevens 1982). When students have different forms of help and review available after making an error, Howe and DuBoulay (1979) have found that students "simply hit the help button for the correct answer rather than use the computer in a cognitive way." Theory would favor a mid-way position which allows both "student control" in deciding whether help is desirable, and allowing "program control", acting as the teacher or "expert" who designates which particular kind of help is appropriate. If students could diagnose their own errors completely, there would be no need for "teachers" or experts.

Clearly, the issue of "student control" is still in need of research.

In the present study, various forms of program-controlled feedback and student-controlled help are compared: programmed correct answers with no further "help"; student controlled request for help followed by programmed decision as to which help is appropriate; and totally student controlled help in which the student requests help and then selects the kind of help desired from a menu (see Appendix B, Day 8).

3.4 Memory and spaced practice: implications for forms of error correction

Behavior modification research suggests the notion that repetition of items to be learned at spaced intervals increases learning. Conditioning theory (Skinner 1953) and social learning theory (Bandura 1977), claim that learning takes place with repeated exposure, over time. This notion has important implications for methods of error correction in CAI. As mentioned, the computer has the capability of responding to student errors in particular ways. The above-mentioned theories of behavior modification would support the hypothesis that CAI programs which repeated the same or parallel items missed by a given student at spaced intervals would be more effective than those which did not repeat the items at all (which is current practice in most foreign language CAI), those which repeated the entire drill, or those which repeated all items missed by the student together, at the end of the entire exercise. The present study compared four ways of recycling missed items: immediate repetition of the same item; immediate repetition of a parallel item (immediate repetition of missed items by way of parallel items might allow a sense of "spaced practiced" conceptually); repetition of the same item at spaced intervals; and repetition of all mistakes together, at the end of the exercise (see Appendix B, Day 6a).

PART TWO: DESIGN OF THE STUDY

4 OVERVIEW OF DESIGN AND SPECIFIC OBJECTIVES

In the introduction to this study, we posed the questions, "What kinds of exercises are most effective in foreign language instruction in general, and what kinds of exercises are most effective in foreign language instruction when the computer is used as a medium?" In the course of the preceding discussion of second language pedagogy, memory research and computer capabilities, several specific hypotheses emerged which suggested particular pedagogical principles, answer judging strategies, and their respective CAI treatments in foreign languages. The specific objectives of this study were to develop CAI exercises which compared these suggested "experimental" treatments with contrasting "control" treatments. A different hypothesis with its respective treatments was introduced daily. For the purposes of research, students had CAI treatments exclusively during the two-week field study, without classroom instruction.
Also for the purposes of research, each suggested pedagogical principle and feedback strategy was examined independently in order to clearly identify what made up the experimental and control treatments, respectively. While such isolation of CAI from classroom instruction, and such singular treatment of pedagogical and answer-judging principles would not be desirable for FL courseware, they were necessary first steps in research.
In these ways, the particular principles and strategies that contributed to final achievement results could be clearly identified for future combined application to FL courseware.

The specific hypotheses are summarized below. A summary of their respective daily treatments follows in Section 5.3.

4.1 Pedagogical hypotheses

P1. The provision of an integrated context for the introduction of discrete structural items will improve memory and subsequent learning of the items (day 4).

P2. Practice in which the student is focused on the meaning of the material will lead to greater learning of structural items than will practice in manipulating the structures themselves, without reference to meaning (day 7).

P3. Exercises containing material which refers to known others will be more effective than those referring to anonymous others (day 2).

P4. Exercises containing material which personally involves the learner because of its emotional or humorous content will be more effective than those with non-emotional

material (day 5).

P5. Students who are able to choose from a "menu" of topics to provide the general context of the exercise will achieve the goal(s) of the exercise more than those who are not able to make such a choice (day 9).

P6. Exercises which require students to draw inferences through problem solving and guessing will be more effective than those which do not (day 6b).

4.2 Answer-judging hypotheses

AJ1. Student discovery strategies: feedback which actively engages students in discovering the correct responses as well as the source of their errors will be more effective than that which does not (day 3):
(1) feedback which provides explanations of errors or locates errors will be more effective than that which gives correct answers only;
(2) feedback which provides a series of graded hints related to the particular item (i.e., provides progressively more information) will be more effective than that which either provides explanations of errors or locates errors only.

AJ2 Student control vs. program control: feedback which combines student controlled help and programmed or "expert" feedback will be more effective than either student or program control, exclusively (day 8).

AJ3. Implicit correction of errors will be more effective than explicit correction of errors (day 10).

AJ4. Repetition at spaced intervals of items missed by students will be more effective than:
(1) repetition of the same or parallel item immediately, or
(2) repetition of all items missed at the end of the entire drill (day 6a).

5 CAI MATERIALS: RESEARCH AND DEVELOPMENT

5.1 Research

Prior to undertaking the development of new CAI exercises for this study, project staff first reviewed and analyzed a wide range of existing foreign language courseware, with a view to adopting or adapting strategies which would exemplify the hypotheses of the study. Existing materials tended to exemplify "control" treatments with respect to the pedagogical hypotheses. Answer judging strategies were found which exemplified both experimental and control feedback treatments, particularly with

respect to student discovery stragies (AJ1 above). The relative effectiveness of, for example, DASHER-type error location strategies were compared with more typical "wrong, try again" feedback. However, existing courseware acted only as a guide. (See Appendix H for a listing of computer software and specific FL courseware adapted for use in this study.) Due to the task of isolating pedagogy and feedback daily, in tandem with the school's curriculum goals for the field study, i.e., the particular linguistic goals set by the classroom teachers, all exercises were designed and programmed especially for the particular research purposes.

5.2 Development of materials for the study

All CAI materials used in the field study were especially developed and programmed by the project staff over a six-month period. Activities were first designed by staff members on paper, reviewed thoroughly for their pedagogical and linguistic content in relation to each hypothesis, and then programmed on the Apple IIe in the "C" language, using the Aztec C-compiler developed for that machine.

Before determining the final content of the lessons, a "student interest survey" was administered to the students who would be participating in the study. Based on this survey, situations and vocabulary used in the lessons were tailored to the interests of their intended audience. (See 6.2.2 for results of this survey.)

5.3 Brief description of CAI materials: daily experimental and control treatments

The following is a brief outline of the daily CAI lessons and the various hypotheses which they test; for a complete description, including details of the various answer-judging comparisons, see Appendix B. When answer-judging strategies were being compared, the exercises were identical, differing only in error feedback. When pedagogical principles were being compared, both experimental and control groups had the same vocabulary and syntax, differing only in the one variable being compared. New vocabulary and/or syntactic items were introduced and tested with each hypothesis.

Day 1 Computer orientation
Introduction to the use of the computer, special keys for Spanish characters, and the format of various exercises from the lessons to be covered.

Day 2, Hypothesis P3: Known vs. anonymous other
Experimental group assigns names of favorite singers, movie stars, etc., to the characters in the narration; control group characters are anonymous "Dick and Jane" types.

Day 3, Hypothesis AJ1: Student discovery
Both groups complete the same exercise, but with four different types of feedback on errors: correct answer only; correct answer with explanation; error location only; error location with graded hints.

Day 4, Hypothesis P1: Integrated vs. non-integrated material
Experimental group reads sequenced, chronological narrative about same two characters; control group reads unconnected sentences about different, unrelated, characters. Sentences for both groups are identical in vocabulary and syntax. They differ only in character names and sequence.

Day 5, Hypothesis P4: Humorous material vs. non-humorous material
Experimental group reads and answers questions about humorous dialog; control group reads and answers questions about similar, non-humorous dialog.

Day 6a, Hypothesis AJ4: Recycling of missed items
Both groups read narrative on clothing and practice completing sentences about things they wear; mistakes are handled in four different ways with respect to recycling of missed items: immediate repetition of same item; immediate repetition of parallel item; repetition of same item at spaced intervals; repetition of all missed items together at the end of the exercise.

Day 6b, Hypothesis P6: Problem-solving vs. non-problem-solving
Experimental group must solve scrambled-picture puzzle in order to answer questions; control group answers questions based on unscrambled pictures before them. Vocabulary and syntax are identical. The graphics are the same during initial lesson presentation and differ only in their position during activities that follow.

Day 7, Hypothesis P2: Meaningful vs. manipulative practice
Experimental group practices material with questions referring to the meaning of the passage; control group practices without reference to meaning.

Day 8, Hypothesis AJ2: Program vs. student control
Both groups are given a chart of information on the basis of which they must answer questions; feedback on errors compares degrees of student-controlled help with the use of automatic help screens.

Day 9, Hypothesis P5: Choosing passage from menu vs. no choice
Experimental group selects one of four stories to read; control group has no choice of story. Activities are

parallel, but relate to the specific story chosen or assigned.

Day 10, Hypothesis AJ3: Implicit vs. explicit correction
Both groups are given a "Mad Lib" exercise in which the program prompts for words, then displays a silly story; feedback on exercise compares explicit correction, ie. "No, the answer is...", with implicit correction through questions which implicitly model the correct verb form, while appearing to probe for more information.

5.4 Pilot Testing of Materials

Materials which were developed for use in the field study were first pilot tested with two different groups of students. First year Spanish students from Mills College, Oakland, California, were used to pilot test the materials for "debugging" on a voluntary basis. A subsequent, larger, group of first year Spanish students from Montera Junior High School--none of whom later participated in the actual field study--used the materials during a two-week period to determine if they were of appropriate difficulty and to identify pedagogical problems as well as additional computer "bugs". For example, during the pilot testing of Day 2, students in the experimental group were asked to type in the name of their favorite singer. One student entered a rock group's name, "Frankie goes to Hollywood," and the program crashed! (The program had been written to anticipate up to two words only.)

Based on pilot test results, extensive revisions were made: elimination of such "bugs", revision of computer orientation activities to increase "user friendliness"; revision of lesson instructions; lengthening of most exercises and the addition of a "help" feature which would allow students to look up the current vocabulary list during the presentation stage of each activity.

6 Field study design

6.1 Field study: overview

Students in the field study population were randomly assigned to experimental and control groups. For a 45-minute period each day over a period of nine days all students received their Spanish instruction exclusively by means of the computer materials designed for this project. Student textbooks were stored during the study to avoid possible influence on lesson treatments. The CAI activity for each day was based on a single hypothesis in order to clearly separate variables and the resultant effects attributable to experimental or control treatments. Evaluation was carried out in two ways: (1) daily achievement tests following the completion of each day's lesson, and (2) pre-test and post-test of all new material introduced during the study. The latter tests were identical; the pre-test was given immediately prior to the study, the post-test a few days after the completion of the nine-day period, following a weekend's delay.

Although data were collected each day, it was not anticipated that major differences would be found on a daily basis, given the short duration of daily treatments and the immediacy of the testing. It is important to reiterate that the hypotheses central to this study (see 4.1) have their foundation in memory theory, in particular the various factors which influence the learner's retention of linguistic material on delayed recall tasks. In order to evaluate longer-term effects, group assignments were maintained throughout the study so that comparisons could be made of the cumulative effects.

Following the 9-day field study period, students were comprehensively tested over the entire range of material. Each section of the post-test, like the pre-test, reflected the instructional goals of a particular hypothesis. While it would have been desirable to re-test the students after a longer period, any results obtained would have been contaminated by teacher intervention following the computer study (teachers reported that they intended to review the material given in the instructional unit).

6.2 Field study population

The field study population consisted of junior high school students in their second semester of second-year Spanish at Montera Junior High School, Oakland, California. Eighty-three students in three Spanish classes, normally taught by two different teachers, took part in the study.

Students were randomly assigned to fixed groups. Four groups were required in order to test the answer-judging hypotheses on days three, six, and eight. The four groups were formed into two primary groups, control and experimental, for the purposes of testing the hypotheses on the remaining days. Table 1 displays basic student demographics broken down by primary experimental and control group assignment. Table 3 displays the test means and T-test probabilility values for each of the pre-test measures. Note that there are no statistically significant differences between groups on any of these measures.

6.2.1 Description of field study population

A background questionnaire administered at the beginning of the study showed that the students were ethnically quite mixed (50% minority) and many were from professional families (43% of parents in professional occupations), though a wide range of professions were represented. (See Appendix A for the complete Background Questionnaire with responses.) By far the majority of the students (86%) had had some previous hands-on exposure to computers, ranging from "minimal" (51%) to "experienced" (35%). Not surprisingly, perhaps, experience with computers for the most part meant games (57%); however, 32% had had some experience with either educational programs (18%), programming (8%), or word-processing (8%). Overall interest in computers was high (39% were "very interested"; on a 1 to 4 point scale, from low to high, the mean score was 3.2.).

Overall attitudes toward the study of Spanish were average. When asked how interested they were in learning Spanish, the mean was 2.8 on a 1 to 4 point scale. When asked to compare their enjoyment of Spanish in relation to other subjects, the mean was 2.3.

The questions designed to measure attitudes toward Spanish speakers showed a marked difference between their general impressions of Spanish-speaking people (16% negative, item #17) and their particular impressions of Spanish-speaking people ("someone with a Spanish accent") they had actually met (3.6% negative, item #21). These findings replicate those of a similar study conducted by Robinson in Australia in which it was concluded that general impressions reflect unconfirmed stereotypes, usually based on limited information and indirect experience while particular impressions reflect specific direct experience, favorable or unfavorable, i.e. "familiarity may breed contempt" in the perception of differences, while "familiarity may increase liking" in the perception of similarities (Robinson 1981:56). In any case, once negative general impressions are formed, they are resistant to change through subsequent particular favorable information (Robinson 1985).

No significant differences between experimental and control groups were found with respect to any of these attitude measures. (See Section 9.2 for a discussion of attitudinal changes which occurred during the study.)

6.2.2 Student interest survey

As mentioned in Section 5.2, the field study population was given a Student Interest Survey early in the development of the CAI materials so that content could be tailored to their interests. This survey consisted of 14 open-ended and 3 forced-choice questions; results included both expected and unexpected answers.

Under the heading of "expected" results are student tastes in consumer products: favorite toothpaste (Crest), soft drink (Coke), and clothes for school (jeans). Also predictably, their most difficult school subjects were math and algebra, their favorite sport was football, and what they most liked to do on Saturday afternoons could be summarized as "hanging out with friends."

Other results only point to the difficulty that adults have in trying to second-guess adolescent interests--or keep up with rapidly-changing fads: Although the staff suspected that Michael Jackson would be one of their favorite male singers (this was in February of 1985), he was only mentioned once, while Prince was mentioned in 45.6% of the responses. Favorite female singer was Madonna, whom none of the adult staff had heard of at that time. Their favorite male movie star was Eddie Murphy ("Beverly Hills Cop" was the big box office hit at the time), their favorite female movie star--inexplicably--was Marilyn Monroe.

In trying to determine what types of stories would interest the group (so as to offer them the right options in the choice-of-story activity on Day 8), we found that romances (25%) were preferred to science fiction (18%), which was all the more puzzling when considering that the population was 60% male. Finally, when asked what aspects of Spanish culture they liked best, the most frequently mentioned was the food, although it is doubtful that most students had a clear idea of the distinction between "Spanish food" and what they may eat at a nearby fastfood taco stand. Other "cultural" aspects they liked included dancing, lifestyle, "the way they talk" and, curiously, "the drinking age"--a possible reference to the imagined free-flowing wine in Spanish-speaking countries. The student interest survey pointed to a simple, but often overlooked part of curriculum materials development: if educators and curriculum developers aim to tailor materials to student interests, it is important to ask intended

students what they are interested in.

6.3 Pre-testing procedures

Students were given two tests prior to the study: (1) the Pimsleur Language Aptitude Battery (PLAB), consisting of four subscales: Language Analysis, Sound/symbol Association, Sound Discrimination, and Vocabulary (see Appendix E); and (2) a specially constructed test of prior knowledge, based on the material to be covered in the different CAI activities of the project materials (this same test was also used as the post-test; see Appendix D). In addition, project staff collected student scores on the California Test of Basic Skills (CTBS) Composite Language and Reading tests. Finally, students were asked to complete a questionnaire on their backgrounds, interests and attitudes (see Appendix A).

6.4 Field testing procedures

Each day of the nine-day period, students were given a different program diskette to use for that day's lesson; the particular version of the lesson they received (experimental or control) depended, of course, on which group they were assigned to for the duration of the study. In addition, each student received a diskette on which to record the data collected for that day. Lessons averaged 15-20 minutes in length. Staff members in attendance were allowed to assist students in any problems that arose regarding the use of the computer or program instructions, but did not assist them with difficulties concerning the content of the lessons.

As soon as each student had been through the day's lesson once, including the tests at the end, the data disk was collected by the staff members present. Students were not permitted to go back and "improve" their day's scores. Most students did, however, practice the lessons again after turning in their data disks, with a view to improving their final overall score. (See Sections 6.5 and 10.3.2 for a discussion of the possible effects of this practice on daily test results.)

6.5 Evaluation

Each day during the nine-day period students completed short tests at the end of the day's activity. The number of tests, as well as the number of items per test, varied for each day (see Table 4).

Tests were of four types: integrative recall (IR), integrative production (IP), discrete recall (DR), and discrete produc-

tion (DP). In the literature on FL testing, "integrative" tests generally refer to those which elicit responses considered to draw upon global skills, e.g. cloze tests, dictation, comprehension questions, etc. Such tests tend to be associated with "communicative competence." "Discrete" tests generally refer to those which elicit responses considered to draw upon one particular skill or elicit a specific lexical or syntactic manipulation. Such tests tend to be associated with "linguistic competence". Test items were categorized according to the latter distinctions and verified by the Senior Project Adviser, Prof. Wilga Rivers (see Appendix C for sample tests). It is important to note, however, that the distinction between integrative and discrete tends to be blurred somewhat when applied to short tests which must necessarily involve recognition and/or production of limited structural or vocabulary items immediately after such items have been taught. As mentioned earlier, the daily presentation and testing of new structural or vocabulary items was essential to isolating the effects of particular treatments. Within the short time span of the two-week field study, only finite curriculum goals could be measured. In this sense, then, most of the daily tests were in fact discrete. (See further discussion in Section 10.3.2)

At the conclusion of the study, students took the achievement post-test (identical to the pre-test), the Pimsleur Language Aptitude Battery, and completed a shorter version of the survey focusing on attitudes that might have changed as a result of their work during the study. Overall achievement in the study could clearly not be measured solely on the basis of gains between pre- and post-tests, but needed to be considered in light of differing backgrounds, aptitudes, abilities and prior achievement in Spanish. For this reason a number of statistical analyses were carried out which take into account these mediating factors (see Section 7).

7 Statistical Procedures

7.1 Data analysis tasks

There were four data analysis tasks. The first was to examine student scores on the pre and post measures in order to determine if there was a difference in student achievement overall, in absolute terms and in light of aptitude, attitudes, abilities and Spanish achievement, immediately prior to the onset of the study. The second task was to examine student test scores for each of the daily activities which isolated each particular pedagogical principle and answer-judging strategy. The third task was to explore possible student attitude changes, as well as aptitude changes as measured on the PLAB, from pre- to post-study. Finally, the individual tests themselves were examined in order to determine if they clustered along a priori dimensions of

"integrative" and "discrete".

7.2 Data analysis procedures

The actual data analysis proceeded in the following manner:

(1) A table of intercorrelations involving all measurement variables was produced in order to explore two questions: First it was felt that even though students' assignment to groups was random, and that tests on the pre-measures revealed little difference between the groups as they were constructed, it was still probable that prior knowledge, aptitudes and/or attitudes would influence achievement. The correlational analysis made it possible to identify possible covariates for use in subsequent tests using analysis of covariance.

(2) The difference between the group means for the four answer-judging groups on days 3, 6, and 8 were tested using one-way analysis of variance. For any of these tests which proved significant, a subsequent multiple pairwise comparison was conducted using the Tukey-Kramer method.

(3) The differences between Control and Experimental group means on each of the daily tests for days 2, 4, 5, 6b, 7, and 9, the difference between Control and Experimental group means on the achievement tests, the PLAB, and the attitude measures, and, finally, the difference between Control and Experimental group means for gain scores on the achievement, PLAB, and attitude measures, were all tested using T-Tests. A T-Test was also used to test the difference between the two answer-judging group means on day 10.

(4) In addition, the table of intercorrelations described in (1) provided a first-level view of how the daily tests grouped together. This analysis helped later in determining the appropriateness of the clustering procedures.

Based on information provided through the correlational analysis, a number of subsequent tests were performed utilizing analysis of covariance procedures. Covariates included pre-achievement scores, several of the PLAB subscales, CTBS scores and pre-attitude scores. These types of analyses were performed both for daily test scores and for gain scores on the achievement test.

Several attitude scales were also analyzed pre- and post-study to determine if students changed their feelings towards the computer, the Spanish language and/or Spanish-speaking people, and their rationale for taking Spanish classes. Simple T-Tests (for testing the null hypothesis that total group mean gains were zero) were used for these analyses.

7.3 Data entry

All of the above data were scored by hand and keypunched on an IBM PC. These raw files were then transferred to a large IBM mainframe computer at Stanford University. The Statistical Analysis System (SAS) was used for all analyses. The principal SAS system data set contains 83 observations, with a total of 164 variables--roughly 14,000 data points in all.

PART THREE: FINDINGS

8 OVERVIEW OF RESULTS

The major finding of the study is that the experimental group significantly outperformed the control group on the cumulative post achievement test gain scores. These scores are consistently in favor of the experimental group both in absolute terms and when scores were mediated by prior knowledge, aptitude, attitudes and abilities, giving strong evidence in favor of the experimental hypotheses and their treatments.

Several other interesting results were obtained:

o Results of the short daily tests are mixed. (As discussed earlier, these tests immediately followed the daily treatment of one particular pedagogical principle or answer judging strategy and of necessity focused on the aspects of vocabulary and grammar newly introduced that day.) Results generally favor the experimental treatment on error feedback days (days 3, 8, 10), were mixed on days 4, 5, 6b, 9, and favor the control group on days 2 and 7 (see Section 5.2).

o The best predictors of achievement for all students, regardless of treatment, were interest and enjoyment of Spanish, (a pre-measure on the background questionnaire).

o The other successful predictors of achievement were the "language analysis" subscale of the PLAB, and the CTBS reading score. These findings suggest that the achievement tests actually favored the control group, who had more practice in manipulating grammar. Despite this disadvantage, the experimental group still outperformed the control group on the cumulative post achievement test, which involved long-term memory and delayed recall.

o The experimental group also outperformed the control group on post PLAB vocabulary test gain scores.

o Attitudes toward computer study, Spanish study or Spanish-speaking people did not appear to change significantly during the study except in one dimension: there was a significant post gain in integrative motivation for the group as a whole. No significant differences were found between experimental and control groups on any attitude dimension.

A detailed discussion of the above findings follows.

9 ATTITUDES, OPINIONS AND OBSERVATIONS

9.1 Attitudes as predictors of achievement

The correlation table (Table 6) shows that initial interest in and enjoyment of Spanish (items #14 and #15, Student Background Questionnaire, Appendix A) were more related to achievement than any other variables, including prior knowledge of Spanish (pre-achievement test), language aptitude (PLAB) or literacy (CTBS scores). This finding coincides with previous research regarding the relationship between motivation and language achievement (cf., for example, Lambert et. al, 1962).

9.2 Pre-post changes in attitudes

As mentioned in the introductory summary, attitudes toward computer study, Spanish study or Spanish-speaking people showed no statistically significant difference between the groups or any significant change for the entire group at the conclusion of the study, with one important exception: the post gain score showed an increase in integrative motivation to learn Spanish for the group as a whole (items #29-32). Various interpretations could account for this finding. Motivation to study Spanish may have been increased by the novelty of the new mode of learning, particularly since the students were near the end of a year-long course in the same classroom. From an opposite perspective, perhaps the total CAI environment, which lacked teacher intervention and even audio or video facsimile, made students appreciate, by contrast, the importance of learning the language to learn about Spanish-speaking people. Student comments regarding the impersonality of the exclusively CAI medium could be interpreted as support for the latter interpretation.

Open-ended questions, which could not be coded numerically and therefore were not submitted to statistical tests, did show some interesting changes during the study. These findings will be discussed together with the opinions and observations that follow.

9.3 Student opinions and staff observations

Anthropologists and social scientists have long recognized the value of obtaining data through the observations of participants (in this case, students) and participant-observers (in this case, staff). In the anthropological literature "observational data" constitutes an ethnographic approach to research, which lends valuable qualitative data unobtainable through quantitative measures (see Robinson 1985 for a detailed discussion of the role of ethnography in FL education).

In the present study, students were extensively interviewed on videotape both in the computer lab and also in a classroom discussion session. Additionally, staff in attendance during the field study kept a log of daily student comments, to which they added their own observations. Finally, two other observers were also interviewed on videotape following one of the lessons: the Principal of Montera Junior High School, Mr. Jim Welsh, and the Senior Project Advisor, Prof. Wilga Rivers, Harvard University. (See Appendix G for transcripts of the latter interviews.) This observational data provided a more complete evaluation of the research project in particular and of computer-assisted language instruction in general. What follows are the combined opinions and observations from these various sources.

9.3.1 Positive views

(1) A forgiving tutor

According to both student comments and staff observations, the computer appeared to be a patient and forgiving tutor, willing to repeat an explanation endlessly without becoming annoyed at a recurrent student mistake. One student commented:

> "It doesn't yell at me when I make a mistake or think I'm stupid."

(2) No self-fulfilling prophecies

Similarly, the computer made no prejudicial assumptions about student abilities based on previous performance. Such assumptions tend to have a negative effect on student achievement (Bloom, 1968). The computer treated all students the same, regardless of the reputations they might have brought in from other classes.

(3) Self-pacing and individualization

Students and staff alike recognized the benefits of individualization and self-pacing; typical student comments:

> "It lets you go at your own speed, so you don't have to wait for other kids to read in the book and stuff like that."

> "A lot more attention is paid to you. You're not ignored... You're sitting right in front of the teacher."

> "It's like your own personal little class."

The post background questionnaire showed that students' assessment of the value of computers for individualized instruction increased 9.4%. Staff also observed unique individualized

learning strategies that students developed. One student secretly put what he thought to be little "cheat sheet notes" onto the disk drive to help him learn the words. Other students frequently called up the vocabulary helpscreens, while still others memorized the vocabulary when initially introduced.

(4) Time on task

Perhaps the most salient observation was the increased student concentration level and attention span while completing the CAI exercises, in contrast to their classroom behavior. In the computer lab, students were continually on task:

> "One day during the study, we spent ten minutes with the group before class taking roll and playing Spanish word games. During this time, students were passing notes to one another, calling out to each other, and were generally rowdy, paying little attention to the teacher. A few minutes later, as soon as they sat down at the computers, there was an immediate change in their demeanor. Two minutes into the lesson, faces were intent upon what they were doing, they were quiet...the only sound in the classroom was the 'click-click-click' of the keyboards."
>
> (staff)

Both the Principal and Senior Project Advisor were particularly impressed by the motivational level the students showed, their intensity of interest, and their time on task.

> "I was very excited to see the intensity of interest the students were showing, and the way in which they seemed to be concentrating...I think one only had to see those students working to realize that they were enjoying what they were doing, and that is the first step towards solving any educational problem."
>
> (Rivers)

The CAI experience had such initial appeal that one student asked her parents for a home computer so she could study Spanish in lieu of a trip to Hawaii! While the intensity of initial enthusiasm was in part due to the novelty or "Hawthorne effect," the increased time on task remained a consistent factor throughout.

(5) Computer literacy

In addition to the above benefits, the CAI experience "helped students become more computer literate" (Principal). In the post background questionnaire, this was also reflected in student comments. When asked to indicate which aspects of computers they liked the most, students mentioned "ease of use" most often.

9.3.2 Negative views

(1) Inflexibility

The most serious concern of students and staff was the inflexibility of the programs. While a forgiving and patient tutor, the computer was also an inflexible one, only accepting responses exactly as anticipated. For example, one program only accepted "Los niños se duermen" [the children fall asleep] to describe a certain graphic, although "se acuestan" [they go to bed] was another plausible, but rejected, response. In another program, students were told they were "wrong" when they pressed the space bar before an otherwise correct answer.

(2) Novelty wears off

By the second week of the project, the Hawthorne effect had begun to diminish. Students commented they were bored when lessons turned out to be too short for the class time, suggesting that if there had been more material--but not just more of the same--their interest might have continued. There was a difference observed between the experimental and control groups in this regard: students in the control group commented of boredom more frequently. One student in the control group who heard his neighbor in the experimental group laughing complained:

"Why did I get the boring one?"

(3) Impersonalness

Perhaps even more important, the computer was viewed as increasingly impersonal. When asked what they liked least about computers on the post background questionnaire, 24% of the students indicated they felt computers were "impersonal machines". One student pointed out:

"I'd rather come to class and have a teacher and be able to discuss things."

9.3.3 Mixed opinions about graphics

Students generally enjoyed the graphics (although the control group was sometimes envious of the experimental group and wondered why they got the boring pictures). An occasional problem arose because of the ambiguity of the graphics: what is "under the tree" to one is "beside the tree" to another. Some students who had amber screens complained of the color, while others commented they wished the graphics were animated. While not within the scope of the present study, there clearly needs to to be further investigation into the varied effects of computer

graphics on achievement as well as on attitudes: color graphics vs. black and white, stationary vs. animated, etc.

9.3.4 Conclusion

In summary, students and staff alike found several advantages to learning on a computer: it is interesting, challenging, self-paced, a bit like having their own private tutor, yet one that doesn't yell at them. At the same time, they were also aware of its shortcomings: it tends to be inflexible, and one can't ask it questions or discuss things with it. And of course, as one student pointed out, if they used them all the time in all of their classes, the novelty would soon wear off.

10 ACHIEVEMENT, APTITUDE AND ABILITIES

10.1 Cumulative post achievement test gains

Overall pre-post achievement gains clearly favor the experimental group. In absolute terms (bottom of Table 3), and when mediating factors such as prior knowledge and abilities are taken into account (Table 2), the experimental group consistently outperformed the control group; specifically, the experimental group's gain scores are significantly higher (.05 level of significance or better) than the control group's scores when mediated for each of the following:

- o Prior knowledge of Spanish (pre-achievement scores)
- o California Test of Basic Skills (CTBS) reading scores
- o CTBS composite scores
- o Pimsleur Language Aptitude Battery (PLAB) composite scores

Due to the lack of any statistically significant differences in gain scores for the control group over the experimental group, and the consistency of the results in favor of the experimental group, there is a high level of confidence that instructional treatments did favor the experimental group. This is especially true in view of the fact that pre- and post-achievement tests were identical, and were directly related to instructional goals.

10.2 Post aptitude gains

Although it is unlikely that one's ability to learn a language would change as the result of a nine-day project, a significant gain in pre-PLAB to post-PLAB vocabulary scores was noted for the experimental group (Table 3). It is interesting that, of the three PLAB subtests, it is the vocabulary test which is most closely related to memory factors. As discussed previously, the experimental hypotheses were based upon memory research and tied to memory factors. Since the particular PLAB vocabulary items had no relationship to the Spanish vocabulary taught in the units, one might surmise that any gains in vocabulary-acquiring skills could be the result of developing or improving learning strategies through the experimental treatments. Other researchers may want to investigate further the relationship between pedagogical treatments and language aptitude gains.

10.3 Daily test results

Not surprisingly, the differences between experimental and control groups on daily tests were less clear-cut than on the cumulative post tests. Without taking prior experience into

account, there were no significant differences between groups on any day (with the exception of one of the three tests on day 7, resulting in balanced findings). However, previous experience must be taken into account to distinguish the effects of the instructional treatments from what students already knew prior to the study. Therefore, the mediated results are of greater interest.

10.3.1 Answer-judging hypotheses

When the daily tests were mediated by pre-achievement scores, a statistically important difference in means was found in favor of one answer-judging treatment on each of the Days 3, 6, 8, and 10 (Table 5). The results are consistent with the experimental answer-judging hypotheses on three out of the four test days: day 3 (student discovery), day 8 (student vs. program control), and day 10 (implicit vs. explicit feedback). On day 6a (recycling of missed items), the hypothesized second best treatment, immediate repetition of a parallel item, was favored over the hypothesized repetition of the same item at spaced intervals.

Answer-judging groups scored as follows (groups are given in descending order according to daily test means):

Day 3 (Aj1) - Student discovery: Groups 4, 2, 1, and 3.

Group 4: Location of error with graded hints

After both first and second mistrials, the program locates the error by blanking out the incorrect part of the corresponding sentence, then gives a hint to help out the student ("She washes something but it isn't the sink."). The content of this hint varies according to which incorrect response the student has chosen.

Group 2: Correct answer with explanation

After the first mistrial, the program responds with "Wrong, try again." After the second mistrial, the correct answer is given, along with an explanatory comment such as "The verb cepillarse means to brush."

Group 1: Correct answer only

After the first mistrial, the program responds with "Wrong, try again." After the second mistrial, the correct answer is given.

Group 3: Location of error only

After the first mistrial, the program identifies the part of the student's answer which is in error by displaying the corresponding sentence with blank spaces for the wrong part. This routine is repeated after the second mistrial; then, following a pause, the correct answer is given.

The findings clearly favor the use of a combination of location of error and hints over correct answer only or location of error alone. The differences between the other group means are too slight to draw conclusions from. However, these findings clearly support the hypothesis that strategies which guide students to discover the correct answer and understand why they made particular errors are more effective than those which do not.

Day 6a (AJ5) - Recycling of missed items: Groups 2, 3, 1, 4

Group 2: Immediate repetition of parallel item

A parallel item (same form, different context) is given following the second mistrial.

Group 3: Repetition of missed items together at the end

Missed items are stored, then repeated at the end of the exercise.

Group 1: Immediate repetition of same item

The same item is repeated immediately following the second mistrial.

Group 4: Repetition of missed items at random intervals

Missed items are stored and repeated at random intervals during the exercise.

The above results do not concur with the hypothesis that items repeated at random intervals will be more effective. In this instance the treatment that was predicted as second best, immediate repetition of parallel items, was favored. However, as discussed earlier, a parallel item may have allowed a sense of conceptual space, although the item followed immediately. Also, given the short time span of each activity on this day, repetition of all items together at the end of each activity might have more accurately represented "spaced practice." The hypothesis was derived from social learning theory, in which spaced practice refers to practice of a similar behavior over time, i.e. over a number of training sessions, in increments of graduated difficulty. Perhaps a more appropriate application of this theory to FL learning for future research would be the

instruction and performance of similar linguistic tasks over a number of training sessions. Based on the present study, one would expect the latter hypothesis to be confirmed.

Day 8 (AJ3) - Program-controlled feedback vs. student controlled help: Groups 3, 2, 4, 1

Group 3: Combined program and student-controlled help

After each mistrial, the student may try again without help or seek help by pressing the "escape" key. After the student requests help, the program automatically calls up the help screen pertinent to the particular error made, and allows the student to retype the response.

Group 2: Total progam-controlled help

After each mistrial the program automatically displays a help screen with hints related to the type of error the student has made; after consulting this screen, the student may try again.

Group 4: Total student-controlled help

After each mistrial the student may try again or seek help by pressing the "escape" key, which calls up a "help menu." From this menu students may then choose the type of help screen they feel they need -- e.g. Do you want to review the vocabulary? the grammar? the story? etc. -- then retype the response.

Group 1: No help: programmed correct answer

The program gives the correct answer and instructs the student to type it in again.

These findings clearly support the hypothesis that a combination of both student control and program control is most effective. When students have total control as in Group 4, they may lack the expertise to diagnose their own errors and/or they may lose valuable time on task while considering the options available. In any case, the ranking of the "no help" Group 1 clearly suggests the need to make some sort of on-line help available to students.

Day 10 (AJ4) - Implicit vs. explicit correction: Groups 2, 1

Group 2: Implicit

On the first and second mistrials, the student's error is

highlighted on the screen, and a question appears which implicitly models the correct form in a communicative manner, such as:

Program: What did he do?
Student: He waked up.
Program: Who did you say woke up?
Student: (new response)

On the third mistrial, the correct answer is given.

Group 1 (explicit): On the first mistrial, the student's error is highlighted on the screen, followed by "No es correcto. Intenta otra vez." (That's not right, try again.) On the second mistrial, the correct answer is explictly modeled and the student tries again; for example:

Program: What did he do?
Student: He waked up.
Program: No. He woke up. Try again

On the third mistrial, the correct answer is given again.

The findings support the hypothesis that implicit modelling of error correction within a communicative context is more effective than explicit correction. Implicit modelling is also akin to giving hints. In this regard, findings here further confirm the evidence in Day 3 of the value of using hints which guide students to discover their errors.

10.3.2 Pedagogical hypotheses

When the daily tests were mediated, results for the different pedagogical treatments were ambiguous.

Most often, results balance out between the two or three tests on any given day. For example, when controlling for prior knowledge of Spanish, i.e., pre-achievement scores, (Table 5) we find the experimental group slightly favored on day 4, ie. at the .01 level of significance, the control group favored on Days 2, 6b, and 7, and results on other days either balanced out across tests, or with no significant differences in any test. With other mediators, findings were equally ambiguous. Such inconsistent findings offer no evidence for rejecting the hypotheses.

There are several interpretations possible for these apparently inconclusive findings, and the discrepancy between daily results and overall post results:

(1) First, one must distinguish between short-term, immediate recall activities and longer-term, delayed recall activities. It is commonly pointed out that rote learning

activities and structural drills, while they may be effective on a short-term basis, do not usually contribute to long-term retention (cf., e.g., Brown 1980). It follows, then, that methods which might appear to be equally or even more effective immediately, in the short term, may actually prove to be less effective in the longer term. This would account for the differences between the daily results and the overall post gains shown by the two groups, since in fact the daily results were based on immediate recall tests and the overall results were based on delayed recall tests.

(2) Similarly, although it was our intention to test both communicative competence (i.e., via the integrative tests) and linguistic competence (the discrete tests), the actual achievement testing tended to measure linguistic competence more than communicative. In other words, as was pointed out earlier (Section 6.5), the distinction between "integrative" and "discrete" tests tends to be blurred by short written tests given immediately following instruction which need to include particular structural and lexical items. By definition, such tests, unlike proficiency tests, are tied to specific contexts and appear to tap similar linguistic factors, regardless of their orientation as integrative or discrete.

These tests were more similar to control group activities, which were generally much more manipulative. This would be especially true on day 7, in which the variable being measured was in fact meaningful practice vs. manipulative practice. Despite the latter similarity, the experimental group outperformed the control group on the cumulative post tests.

(3) A further factor which may have confounded the results on the daily tests is the distraction which may have resulted from certain experimental treatments. For example, the use of student-chosen names of movie stars in the Day 2 experimental exercise, or the problem-solving activities involving unscrambling pictures in Day 6b, may have had the short-term effect of distracting students from the task at hand, even while they were contributing to increased retention in the longer term.

(4) An additional factor mentioned earlier in the discussion of procedures was the number of times students were exposed to the lessons. As was pointed out in Section 6.4, students were required to turn in their data disks after completing the day's lesson the first time so as not to confound learning trials and daily test scores. Students would then normally run through the lesson at least once more, after which they commented that they felt much more sure of their answers and wished that they could go back and change the data. (Researchers also observed a noticeable difference between the experimental and control groups in motivation the second time through: the experimental group tended to maintain more interest than the control group, who

commented more often of boredom (see Section 8)). One likely effect of this practice, obviously, is that overall scores would tend to show greater improvement than daily scores, since by that time the material had been covered more thoroughly. Therefore, unlike the daily scores, the overall post scores represent the cumulative effects of having acquired the material through either the control or the experimental treatments.

10.4 Clustering of tests

Tests were developed according to the categories of integrative recall, (IR) integrative production (IP), discrete recall (DR) and discrete production (DP) to insure that the complete battery of tests would not be biased in favor of one treatment. Both groups took all tests. The discrete production and recall tests were thought to favor the control treatments, while an equal number of integrative production and recall tests were thought to favor the experimental treatments. However, results of the cluster analyses of the tests themselves also showed a lack of distinction between the a priori categories of "integrative" and "discrete". That is, student performance on daily achievement tests did not generally differ depending on the type of test, regardless if they were in the experimental group, the control group, or viewed as one group. Only one out of five groups of tests scores actually clustered together according to the a priori categories. This finding suggests that the majority of tests tapped similar factors. The latter supports Carroll's notion that different tests eventually test a nucleus of knowledge involving vocabulary and grammar (Carroll, 1973). (See Table 7 for a listing of test clusters and description of the tests that did cluster.)

10.5 Correlations between CTBS, PLAB and achievement

Similarly, significant correlations found between CTBS and achievement, and the PLAB language analysis subtest and achievement (see Correlation matrix, Table 6), also suggest that the tests in general tapped similar factors. That is, all written language tests, regardless if of the IR, IP, DR, or DP type, may rely heavily upon reading and grammatical skills. In any event, this appeared to be the case regarding the particular tests used in this study. These correlations might also explain why the control group, whose methods more often reflected traditional reading and grammatical analysis (e.g. Day 7 in particular), outperformed the experimental group on Days 2, 6a, and 7. Control treatments were perhaps more consistent with the form of written testing; i.e., they tended to favor "test-takers."

11 CONCLUSION: IMPLICATIONS AND RECOMMENDATIONS

Despite the apparent similarity of control activities and the tests, the experimental group still showed a clear advantage over the control group on daily test scores for most answer--judging hypotheses and on the post cumulative gain scores, which covered all the material introduced through the different pedagogical as well as answer-judging treatments. Given the overall higher gains of the experimental treatments (although not always disclosed on a daily basis), what do all of these hypotheses have in common?

11.1 The common denominators

What all of these hypotheses have in common is an emphasis on meaningfulness and student discovery. The material must be meaningful both in the cognitive sense (how language relates to the world around us) and in the affective sense (how language relates to our inner selves and the things we care about). Instructional activities and feedback strategies must also lead students to actively discover the material, allowing comprehension to take place (which is always related to past frame of reference and the active making of inferences).

As discussed in the review of literature (Sec. 3), the emphasis on meaning and student discovery is not new to the language teaching profession. Many language teaching theorists have been saying as much for years (cf. Stevick 1976, Krashen 1981, Rivers 1964, 1981, Robinson 1981), and many approaches focusing on meaning have been developed. They are part of an overall philosophy of language teaching which is exemplified in the British communicative approach and in interactive language teaching where students use language constantly, with the teacher, with each other, and with the community that speaks the language to convey meanings of importance to <u>them</u> (Rivers 1985).

The present study offers empirical evidence in favor of such approaches which stress meaningfulness and student discovery. Perhaps even more important than confirming what language educators have already known, the particular contribution of the present study has been to isolate and define the ingredients that make up "meaningfulness" and "discovery strategies".

The six pedagogical hypotheses outlined in Section 4.1 can be summarized briefly as follows: Language learning material will be more effective if it is presented and <u>practiced</u> in an integrated context (P1) in which students' attention is focused on the meaning of the material (P2) and language is used to draw inferences, as in solving a problem (P6). Furthermore, students should be able to relate personally to this material, either because it contains reference to themselves or to people they

know (P3), because it is amusing or otherwise emotionally appealing to them (P4), or because it is material which they select out of personal interest (P5).

The four answer-judging hypotheses outlined in Section 4.2 may be summarized briefly as follows: Feedback to the student when a mistake is made is more effective if, instead of merely displaying the correct answer, errors are located by highlighting or by blanking out wrong characters at the same time students are led to discover the correct answers by means of graded hints (AJ1), or the question is rephrased to offer implicit correction through modeling within a meaningful context (AJ4). It is important to stress that "leading" students to "discover" requires combining expertise of the teacher or program author with student control of the process, such as the combination of student-controlled help and programmed-controlled feedback that was found to be the most effective form of help (AJ3). Furthermore, it would appear that missed items might most effectively be followed by a parallel item so that the student may apply reasoning to a new instance of the problem rather than being forced to mindlessly type in the same item (AJ5). "Wrong, try again", followed by correct answers, lends little help in guiding students to discover answers.

Together, the above principles and feedback strategies may be viewed as a generic checklist for the successful organization of materials.

Of equal importance is what was learned from student opinions, staff observations and piloting. The computer can be a valuable tool: it challenges students and encourages them to develop their own learning strategies, while proceeding at their own pace; it is also a forgiving and patient private tutor. But at the same time it is a mechanical, impersonal and inflexible tutor, accepting student responses only exactly as anticipated. Piloting materials helps to identify mechanical problems (bugs), inflexibility ("user-unfriendliness") and pedagogical problems (content appropriateness in terms of amount of time, level of difficulty, clarity of instructions and interest.) Student interest surveys also help to develop programs which are motivating. However, the impersonal quality of computer instruction can only be remedied by balancing CAI with the human element: ensuring that CAI is an integral rather than separate component of the total program of instruction, and that teachers are likewise an integral part of the CAI laboratory.

By applying the above principles, feedback strategies and research techniques, the profession may come one step closer to understanding just how the aim of communication may effectively be achieved in texts as well as in computer software.

11.2 Recommendations for further research

Needlesss to say, there are other hypotheses pertaining to FL pedagogy and CAI worthy of research which were not possible to include within this one-year project.

Foreign language pedagogy

In the area of FL pedagogy, other researchers may wish to examine further the issue of personal meaning. The present study compared the relative effectiveness of using material containing known others (singer or actor chosen by the student) with material referring to anonymous others of the traditional Juan and Maria type. It would be useful to carry this study further by investigating the relative effectiveness of material based on self-reference (hence with a high affective level) with material based only on word definitions (low affective level).

While the present study also compared integrated with non-integrated exercises, and communicative with manipulative drills, other studies may wish to examine the use of exercises developed around notions and functions compared with other formats. Testing of a notional/functional hypothesis would require a longer field study than that of the present project.

Computer capabilites: dialogue branching; audio/video interface

The present study also compared the relative effectiveness of allowing students to choose story topics from a menu with assigned stories. This hypothesis is related to the theory that comprehension relies heavily upon what the learner already knows. In a similar fashion, one could hypothesize that student-controlled dialogue branching would also be more effective than pre-set program-assigned dialogues. (Dialogue branching was ruled out as impractical in the present study due to the language level of the field study population and the programming time required.)

Future researchers may wish to examine the effects of audio and video interface on achievement and proficiency. Are they cost effective? Motivationally effective? In addition to the effects of these media on achievement and proficiency, what is their effect on user attitudes toward speakers of the language?

Longer-term studies for proficiency testing

Research over a longer period of time will be needed to assess the relationship between different pedagogical strategies,

including CAI strategies, and overall language proficiency. The present study clearly showed the differences between short-term daily achievement results and overall cumulative achievement results. While the former tests may indeed measure daily achievement with respect to particular linguistic goals, such measures are not indicative of overall cumulative achievement gains, which are of greater interest to language educators. Of even greater interest are changes in student proficiency. Since language proficiency measures are not sensitive enough to identify change within a two-week instructional period, longer-term field studies are needed.

CAI in the instructional program: the need for a synthesis

The findings of the present study, as we have seen, have clear implications for foreign language teaching both in the classroom and through the use of the computer. What is needed at this point is a well-formulated synthesis of the two. We need to develop complete instructional programs which selectively integrate those pedagogical principles and feedback strategies which have now been shown to be most effective. Where computers are used, every effort should be made to use them in ways which are consistent with the overall goals of the language course. This may mean rejecting or discarding courseware based on principles which are alien to those of the course. Certainly it should include an effort on the part of language teachers, administrators, and materials developers to find new and more appropriate ways of integrating CAI into the classroom curriculum. The next step will be to incorporate audio and video components, where possible, to provide a richer and more authentic communicative environment, although this was not investigated in this study. Only when such efforts have been made can we fairly judge the true educational potential of the technology which confronts us.

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TABLES

TABLE 1

Student Characteristics by Assigned Group

		Control		Experimental		N	Missing
Answer Judging Group:		1	2	3	4		
Sex	Boys	16	10	14	10	50	
	Girls	6	10	6	11	33	
							0
Grade	7	1	4	0	0	5	
	8	3	7	5	5	20	
	9	17	9	15	16	57	
							1
Teacher	1	16	12	13	12	53	
	2	3	5	4	9	21	
							9
Can Type?	Yes	14	13	14	14	55	
	No	5	4	3	7	19	
							9
How Long Have You Been Typing? (Average Months)		33	40	25	49		

TABLE 2

Analysis of Covariance on Achievement Test Gain Scores
Means and Proability Values with Various Covariates

Covariate	N (Exp/Cntrl)	Control Mean	Experimental Mean	P	Group*
None	42/37	30.81	34.43	0.32	
Achievement Pretest	42/37	30.81	34.43	) 0.01	(e)
CTBS Composite Language	35/33	32.91	35.27	) 0.05	(e)
CTBS Reading	35/33	33.11	35.27	) 0.03	(e)
Interest in Learning Spanish	36/35	32.44	34.54	0.51	
Enjoyment of Spanish Class	36/35	32.44	34.54	0.76	
Pimsleur Pretests Composite Score	41/36	31.12	33.69	) 0.02	(e)

Note: Each of the above variables was found to be related to Gain scores. See Table of Intercorrelations, Appendix A.

P values preceeded by ')' are judged significant.

* Letter in parens indicates group with higher mean; c=Control, e=Experimental.

Table 3

Test Means and T-Test
Probability Values

TEST (#, SCALE, NUMBER OF ITEMS)	N (CNTL/EXP)	CONTROL Mean	EXPERIMENTAL Mean	P*	Group[1]
CTBS Composite Language	35/36	81.8	85.86	0.33	
CTBS Reading	35/36	78.66	79.69	0.84	
Pimsleur (Pretest)					
Language Analysis	41/40	9.02	9.35	0.65	
Sound/Symbol Assoc	41/40	18.88	19.75	0.24	
Sound Discrim.	41/40	18.00	17.97	0.98	
Vocabulary	41/40	12.83	13.62	0.42	
Composite	41/40	58.73	60.70	0.41	
Pimsleur (Posttest)					
Language Analysis	40/34	10.02	10.26	0.79	
Sound/Symbol Assoc.	40/34	19.72	20.50	0.29	
Sound Discrim.	40/34	17.80	18.97	0.36	
Vocabulary	40/34	12.97	15.55	) 0.02	(e)
Composite	40/34	60.52	65.29	0.10	
Pimsleur Gains (Posttest-Pretest)					
Language Analysis	39/34	1.00	1.00	1.00	
Sound/Symbol Assoc.	39/34	0.82	0.85	0.96	
Sound Discrim.	39/34	0.18	1.06	0.40	
Vocabulary	39/34	0.44	2.15	) 0.02	(e)
Composite	39/34	2.44	5.06	0.12	
Achievement Tests:					
Pretest Composite	42/37	75.81	72.92	0.57	
Postest Composite	42/41	106.62	107.46	0.85	
Gain (Posttest-Pretest)	42/37	30.81	34.43	0.32	

* Tests for unequal variances were performed in each case. When variances appeared unequal, reported P values are adjusted.

CTBS Composite Language and Reading scores were taken from student records.

1. P Values preceeded by ')' are judged significant. Letter in parens indicates group with higher mean; c=Control, e=Experimental.

TABLE 4

Classification of Daily Tests: Number of Tests, Types, and Number of Items per Test

DAY	TEST NUMBER	TEST TYPE	NUMBER OF ITEMS
2	Test 1	IR	(10)
2	Test 2	IP	(5)
2	Test 3	IR	(5)
4	Test 1	IR	(10)
4	Test 2	IR	(5)
4	Test 3	IP	(7)
5	Test 1	DR	(5)
5	Test 2	IR	(5)
5	Test 3		(9)
6	Test 2	IR	(7)
6	Test 3	DP	(5)
7	Test 1	DP	(10)
7	Test 2	IP	(5)
9	Test 1	None	(12)
9	Test 2	DR	(5)
ANSWER JUDGING BLOCKS:			
3	Test 1	DR	(6)
3	Test 2	IR	(7)
6	Test 1	IP	(6)
8	Test 1	IP	(8)
8	Test 2	DP	(5)
10	Test 1	IR	(6)
10	Test 2	DP	(18)

TABLE 5

Analysis of Covariance on Daily Test Means
Experimental vs. Control Groups
Achievement Pretest as Covariate

DAY	TEST (#, SCALE, NUMBER OF ITEMS)	N (CNTL/EXP)	CONTROL Mean	EXPERIMENTAL Mean	P(1)	Group(2)
2	Test 1: IR (10)	35/35	8.11	7.94	) 0.01	(c)
2	Test 2: IP (5)	34/34	3.06	2.68	) 0.01	(c)
2	Test 3: IR (5)	34/29	4.41	4.41	0.34	
4	Test 1: IR (10)	35/32	9.23	9.19	) 0.02	(c)
4	Test 2: IR (5)	34/32	3.82	3.97	) 0.01	(e)
4	Test 3: IP (7)	34/32	6.50	6.28	0.63	
5	Test 1: DR (5)	38/34	4.47	4.47	0.25	
5	Test 2: IR (5)	38/34	3.74	3.97	) 0.01	(e)
5	Test 3: (9)	38/34	4.79	4.12	) 0.01	(c)
6	Test 2: IR (7)	36/28	3.64	3.61	) 0.02	(c)
6	Test 3: DP (5)	36/28	3.44	3.12	) 0.01	(c)
7	Test 1: DP (10)	36/35	6.19	5.11	) 0.01	(c)
7	Test 2: IP (5)	36/35	3.78	2.57	) 0.01	(c)
9	Test 1: None (12)	37/34	8.22	8.47	) 0.01	(e)
9	Test 2: DR (5)	37/34	3.97	3.82	) 0.01	(c)

ANSWER JUDGING BLOCKS: (3)		N1/N2/N3/N4	Group 1	Group 2	Group 3	Group 4	P(1)	
3	Test 1: DR (6)	22/16/13/20	5.59	5.87	5.77	5.65	0.86	
3	Test 2: IR (7)	22/16/13/20	5.27	5.62	5.23	5.70	) 0.01	(e)
6	Test 1: IP (6)	20/16/10/18	3.45	3.81	3.50	3.06	) 0.01	
8	Test 1: IP (8)	21/16/16/17	4.57	5.44	5.62	4.94	) 0.05	(e)
8	Test 2: DP (5)	19/16/15/17	3.68	4.12	3.07	3.94	0.42	
10	Test 1: IR (6)	34/32	4.06	4.09	----	----	) 0.02	(e)
10	Test 2: DP (18)	33/32	11.39	11.75	----	----	) 0.01	(e)

NOTES

1 P values preceeded by ' ' are judged significant.

2 Letter within parenthesis indicates direction of difference; c=Control; e=Experimental.

3 An analysis of co-variance among the answer judging treatments showed important differences on all four answer-judging days. While multiple pairwise comparison tests were not sensitive enough to isolate the differences, the numerical order of differences between the answer judging means are in agreement with the experimental hypotheses on days 3, 8, and 10.

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	O2TST1	O2TST2	D2TST3	D3TST1	D3TST2	D4TST1	O4TST2	D4TST3	O5TST1	O5TST2
CTBCMP CTBS TOTAL LANGUAGE PERCENTILE SCORE	0.38569 0.0020 62	0.37578 0.0031 60	0.29325 0.0298 55	0.14122 0.2696 63	0.50272 0.0001 63	0.31276 0.0150 60	0.36553 0.0044 59	0.21285 0.1055 59	0.50532 0.0001 64	0.16772 0.1853 64
CTBRD CTBS READING PERCENTILE SCORE	0.28320 0.0257 62	0.27372 0.0343 60	0.27594 0.0414 55	0.05517 0.6676 63	0.31644 0.0115 63	0.19600 0.1334 60	0.29989 0.0210 59	0.24600 0.0604 59	0.49401 0.0001 64	0.05550 0.6631 64
Q9 INTEREST IN COMPUTERS	-0.10214 0.4182 65	-0.17712 0.1649 63	0.12419 0.3530 58	0.32620 0.0075 66	-0.18279 0.1418 66	-0.25950 0.0434 61	-0.28911 0.0238 61	-0.00885 0.9460 61	0.03030 0.8077 67	-0.07590 0.5416 67
Q15 ENJOYMENT OF SPANISH	0.19483 0.1199 65	0.27397 0.0298 63	0.05476 0.6831 58	-0.06512 0.6034 66	0.20301 0.1021 66	0.24727 0.0547 61	0.31610 0.0131 61	0.14585 0.2621 61	0.10918 0.3791 67	0.34319 0.0045 67
Q14 INTEREST IN LEARNING SPANISH	0.34070 0.0055 65	0.35132 0.0048 63	0.14109 0.2908 58	-0.20131 0.1051 66	0.31320 0.0104 66	0.44179 0.0004 61	0.49197 0.0001 61	0.22320 0.0838 61	0.22958 0.0616 67	0.39324 0.0010 67
ACHCOMP PRETEST COMPOSITE SCORE TST1-TST12	0.49055 0.0001 70	0.43698 0.0002 68	0.18668 0.1429 63	0.04053 0.7372 71	0.43525 0.0001 71	0.33895 0.0050 67	0.36477 0.0026 66	0.00903 0.9427 66	0.19693 0.0973 72	0.35998 0.0019 72
PACHLOMP POST COMPOSITE SCORE PTST1-PTST12	0.65490 0.0001 72	0.60641 0.0001 70	0.30571 0.0133 65	0.01308 0.9126 73	0.62899 0.0001 73	0.70705 0.0001 69	0.69835 0.0001 68	0.25525 0.0357 68	0.44771 0.0001 74	0.55177 0.0001 74
GAIN POSTTEST COMP - PRETEST COMP	0.13748 0.2564 70	0.15853 0.1966 68	0.07054 0.5828 63	-0.02962 0.8063 71	0.15112 0.2084 71	0.40252 0.0007 67	0.38218 0.0015 66	0.25513 0.0387 66	0.28677 0.0146 72	0.25688 0.0294 72
COMP PIMSLEUR COMPOSITE ON PRE TEST	0.26922 0.0242 70	0.19907 0.1010 69	0.21306 0.0910 64	-0.00063 0.9959 71	0.31427 0.0076 71	0.27686 0.0233 67	0.25953 0.0353 66	0.11965 0.3386 66	0.15199 0.1993 73	0.02290 0.8475 73
LNGANAL PIMSLEUR LANGUAGE ANALYSIS SCALE - PRE	0.29817 0.0122 70	0.32025 0.0073 69	0.13518 0.2869 64	-0.23490 0.0486 71	0.38742 0.0008 71	0.39101 0.0011 67	0.42484 0.0004 66	0.24755 0.0451 66	0.26791 0.0219 73	0.07763 0.5139 73
SSASSOC PIMS. SOUND-SYMBOL ASSOC. SCALE - PRE	0.02758 0.8207 70	0.04002 0.7440 69	0.01488 0.9071 64	0.09077 0.4515 71	0.09953 0.4089 71	0.05028 0.6861 67	0.07696 0.5391 66	0.05413 0.6660 66	0.09633 0.4175 73	-0.07997 0.5013 73
SNOISCR PIMSLEUR SOUND DISCRIM SCALE - PRE	0.26092 0.0291 70	0.09950 0.4159 69	0.24485 0.0512 64	0.05800 0.6309 71	0.25305 0.0332 71	0.28509 0.0194 67	0.22809 0.0655 66	0.14901 0.2324 66	0.04414 0.7108 73	0.05255 0.6588 73
VOCAB PIMSLEUR VOCABULARY SCALE - PRE	0.17309 0.1519 70	0.13140 0.2818 69	0.19251 0.1275 64	0.04590 0.7038 71	0.16714 0.1636 71	0.07048 0.5709 67	0.03478 0.7816 66	-0.07572 0.5457 66	0.05715 0.6311 73	0.00963 0.9355 73

TABLE 6
Intercorrelations

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	D5TST3	D6TST1	D6TST2	D6TST3	D7TST1	D7TST2	D8TST1	D8TST2	D9TST1	D9TST2
CTBCMP CTBS TOTAL LANGUAGE PERCENTILE SCORE	0.28019 0.0249 64	0.21634 0.1060 57	0.34512 0.0092 56	0.32661 0.0140 56	0.38348 0.0016 65	0.19494 0.1197 65	0.46344 0.0001 63	0.28718 0.0248 61	0.23181 0.0653 64	0.02806 0.8258 64
CTBRD CTBS READING PERCENTILE SCORE	0.26559 0.0339 64	0.33319 0.0113 57	0.31831 0.0168 56	0.40854 0.0018 56	0.31742 0.0100 65	0.24751 0.0468 65	0.55742 0.0001 63	0.38601 0.0021 61	0.11216 0.3776 64	-0.06155 0.6290 64
Q9 INTEREST IN COMPUTERS	-0.11945 0.3356 67	-0.17890 0.1752 59	-0.23715 0.0705 59	-0.23002 0.0797 59	-0.24108 0.0494 67	-0.07674 0.5371 67	-0.24893 0.0455 65	-0.11769 0.3623 62	-0.11348 0.3605 67	0.08443 0.4970 67
Q15 ENJOYMENT OF SPANISH	0.36239 0.0026 67	0.39970 0.0017 59	0.29566 0.0230 59	0.31957 0.0136 59	0.28245 0.0206 67	0.42868 0.0003 67	0.31637 0.0102 65	0.13230 0.3053 62	0.24705 0.0439 67	0.34614 0.0041 67
Q14 INTEREST IN LEARNING SPANISH	0.38835 0.0012 67	0.41978 0.0009 59	0.25099 0.0552 59	0.33009 0.0107 59	0.38085 0.0015 67	0.36288 0.0025 67	0.36030 0.0032 65	0.10185 0.4309 62	0.38291 0.0014 67	0.37267 0.0019 67
ACHCOMP PRETEST COMPOSITE SCORE TST1-TST12	0.41863 0.0003 72	0.47299 0.0001 64	0.35896 0.0036 64	0.41018 0.0008 64	0.45575 0.0001 71	0.42840 0.0002 71	0.34124 0.0038 70	0.01806 0.8846 67	0.36940 0.0015 71	0.40424 0.0005 71
PACHCOMP POST COMPOSITE SCORE PTST1-PTST12	0.66536 0.0001 74	0.63240 0.0001 66	0.60497 0.0001 65	0.66232 0.0001 65	0.76162 0.0001 74	0.64690 0.0001 74	0.67774 0.0001 73	0.28352 0.0174 70	0.57605 0.0001 74	0.47687 0.0001 74
GAIN POSTTEST COMP - PRETEST COMP	0.26672 0.0235 72	0.09787 0.4417 64	0.23117 0.0661 64	0.22553 0.0732 64	0.32249 0.0061 71	0.20672 0.0837 71	0.35689 0.0024 70	0.28744 0.0183 67	0.21080 0.0776 71	0.02310 0.8483 71
COMP PIMSLEUR COMPOSITE ON PRE TEST	0.33381 0.0039 73	0.38241 0.0015 66	0.31863 0.0097 65	0.35678 0.0035 65	0.50546 0.0001 73	0.35790 0.0019 73	0.45492 0.0001 71	0.27124 0.0242 69	0.10327 0.3880 72	0.06942 0.5623 72
LNGANAL PIMSLEUR LANGUAGE ANALYSIS SCALE - PRE	0.42324 0.0002 73	0.40508 0.0007 66	0.39374 0.0012 65	0.33636 0.0062 65	0.36717 0.0014 73	0.32961 0.0044 73	0.43416 0.0002 71	0.24081 0.0462 69	0.27404 0.0198 72	0.11882 0.3202 72
SSASSOC PIMS. SOUND-SYMBOL ASSOC. SCALE - PRE	0.16866 0.1537 73	0.21006 0.0905 66	0.10924 0.3863 65	0.27000 0.0296 65	0.36575 0.0015 73	0.12240 0.3023 73	0.30216 0.0104 71	0.22269 0.0659 69	-0.04218 0.7250 72	0.04232 0.7241 72
SNDISCR PIMSLEUR SOUND DISCRIM SCALE - PRE	0.24249 0 0387 73	0.28158 0.0220 66	0.21682 0.0828 65	0.29477 0.0171 65	0.47816 0.0001 73	0.38226 0.0008 73	0.29138 0.0137 71	0.09776 0.4242 69	0.13687 0.2516 72	0.24771 0.0359 72
VOCAB PIMSLEUR VOCABULARY SCALE - PRE	0.13884 0.2414 73	0.20727 0.0949 66	0.20157 0.1074 65	0.13598 0.2801 65	0.22532 0.0553 73	0.17119 0.1476 73	0.28608 0.0156 71	0.22328 0.0652 69	-0.04901 0.6827 72	-0.19085 0.1083 72

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	D10TST1	D10TST2	ACHCOMP	PACHCOMP	COMP	LNGANAL	SSASSOC	SNDISCR	VOCAB	GAIN
CTBCMP CTBS TOTAL LANGUAGE PERCENTILE SCORE	0.21216 0.0978 62	0.31474 0.0135 61	0.17681 0.1492 68	0.39708 0.0006 71	0.46047 0.0001 70	0.36550 0.0019 70	0.37828 0.0012 70	0.29728 0.0124 70	0.24183 0.0437 70	0.29295 0.0153 68
CTBRD CTBS READING PERCENTILE SCORE	0.11357 0.3835 61	0.19934 0.1268 60	0.11271 0.3601 68	0.35993 0.0020 71	0.58150 0.0001 70	0.48968 0.0001 70	0.36877 0.0017 70	0.22809 0.0576 70	0.48628 0.0001 70	0.31215 0.0096 68
Q9 INTEREST IN COMPUTERS	-0.14753 0.2447 64	-0.27840 0.0271 63	0.06926 0.5660 71	-0.16869 0.1508 74	-0.15740 0.1835 73	-0.11637 0.3268 73	-0.25827 0.0274 73	-0.05178 0.6635 73	-0.04342 0.7153 73	-0.29247 0.0133 71
Q15 ENJOYMENT OF SPANISH	0.17897 0.1571 64	0.27689 0.0280 63	0.47564 0.0001 71	0.50165 0.0001 74	-0.04916 0.6796 73	0.04213 0.7234 73	-0.06612 0.5783 73	-0.03200 0.7881 73	-0.06557 0.5815 73	0.05685 0.6377 71
Q14 INTEREST IN LEARNING SPANISH	0.27525 0.0277 64	0.38604 0.0018 63	0.38274 0.0010 71	0.51741 0.0001 74	-0.05182 0.6633 73	0.13928 0.2399 73	-0.18517 0.1168 73	0.10793 0.3634 73	-0.18812 0.1110 73	0.12705 0.2911 71
ACHCOMP PRETEST COMPOSITE SCORE TST1-TST12	0.34402 0.0047 66	0.46812 0.0001 65	1.00000 0.0000 79	0.71800 0.0001 79	-0.02037 0.8604 77	0.10410 0.3676 77	-0.05829 0.6146 77	0.01710 0.8827 77	-0.09537 0.4093 77	-0.45697 0.0001 79
PACHCOMP POST COMPOSITE SCORE PTST1-PTST12	0.41237 0.0004 69	0.71474 0.0001 68	0.71800 0.0001 79	1.00000 0.0000 83	0.25204 0.0232 81	0.31873 0.0037 81	0.09707 0.3887 81	0.21288 0.0564 81	0.09602 0.3938 81	0.29102 0.0093 79
GAIN POSTTEST COMP - PRETEST COMP	0.08508 0.4970 66	0.29064 0.0188 65	-0.45697 0.0001 79	0.29102 0.0093 79	0.33429 0.0030 77	0.25807 0.0234 77	0.24073 0.0350 77	0.18889 0.0999 77	0.25418 0.0257 77	1.00000 0.0000 79
COMP PIMSLEUR COMPOSITE ON PRE TEST	0.03024 0.8066 68	0.31803 0.0082 68	-0.02037 0.8604 77	0.25204 0.0232 81	1.00000 0.0000 81	0.70552 0.0001 81	0.69225 0.0001 81	0.68439 0.0001 81	0.71661 0.0001 81	0.33429 0.0030 77
LNGANAL PIMSLEUR LANGUAGE ANALYSIS SCALE - PRE	0.10601 0.3896 68	0.42521 0.0003 68	0.10410 0.3676 77	0.31873 0.0037 81	0.70552 0.0001 81	1.00000 0.0000 81	0.31097 0.0047 81	0.35392 0.0012 81	0.39765 0.0002 81	0.25807 0.0234 77
SSASSOC PIMS. SOUND-SYMBOL ASSOC. SCALE - PRE	-0.03872 0.7539 68	0.20195 0.0986 68	-0.05829 0.6146 77	0.09707 0.3887 81	0.69225 0.0001 81	0.31097 0.0047 81	1.00000 0.0000 81	0.32794 0.0028 81	0.37262 0.0006 81	0.24073 0.0350 77
SNDISCR PIMSLEUR SOUND DISCRIM SCALE - PRE	0.30863 0.0104 68	0.32901 0.0062 68	0.01710 0.8827 77	0.21288 0.0564 81	0.68439 0.0001 81	0.35392 0.0012 81	0.32794 0.0028 81	1.00000 0.0000 81	0.17328 0.1219 81	0.18889 0.0999 77
VOCAB PIMSLEUR VOCABULARY SCALE - PRE	-0.26161 0.0312 68	0.01489 0.9041 68	-0.09537 0.4093 77	0.09602 0.3938 81	0.71661 0.0001 81	0.39765 0.0002 81	0.37262 0.0006 81	0.17328 0.1219 81	1.00000 0.0000 81	0.25418 0.0257 77

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	CTBCMP	CTBRD	Q9	Q14
CTBCMP CTBS TOTAL LANGUAGE PERCENTILE SCORE	1.00000 0.0000 71	0.74155 0.0001 70	-0.04848 0.7013 65	0.06357 0.6149 65
CTBRD CTBS READING PERCENTILE SCORE	0.74155 0.0001 70	1.00000 0.0000 71	0.01879 0.8828 64	-0.00282 0.9824 64
Q9 INTEREST IN COMPUTERS	-0.04848 0.7013 65	0.01879 0.8828 64	1.00000 0.0000 74	-0.00045 0.9970 74
Q15 ENJOYMENT OF SPANISH	0.02439 0.8471 65	0.09472 0.4566 64	0.04401 0.7096 74	0.66848 0.0001 74
Q14 INTEREST IN LEARNING SPANISH	0.06357 0.6149 65	-0.00282 0.9824 64	-0.00045 0.9970 74	1.00000 0.0000 74
ACHCOMP PRETEST COMPOSITE SCORE TST1-TST12	0.17681 0.1492 68	0.11271 0.3601 68	0.06926 0.5660 71	0.38274 0.0010 71
PACHCOMP POST COMPOSITE SCORE PTST1-PTST12	0.39708 0.0006 71	0.35993 0.0020 71	-0.16869 0.1508 74	0.51741 0.0001 74
GAIN POSTTEST COMP - PRETEST COMP	0.29295 0.0153 68	0.31215 0.0096 68	-0.29247 0.0133 71	0.12705 0.2911 71
COMP PIMSLEUR COMPOSITE ON PRE TEST	0.46047 0.0001 70	0.58150 0.0001 70	-0.15740 0.1835 73	-0.05182 0.6633 73
LNGANAL PIMSLEUR LANGUAGE ANALYSIS SCALE - PRE	0.36550 0.0019 70	0.48968 0.0001 70	-0.11637 0.3268 73	0.13928 0.2399 73
SSASSOC PIMS. SOUND-SYMBOL ASSOC. SCALE - PRE	0.37828 0.0012 70	0.36877 0.0017 70	-0.25827 0.0274 73	-0.18517 0.1168 73
SNDISCR PIMSLEUR SOUND DISCRIM SCALE - PRE	0.29728 0.0124 70	0.22809 0.0576 70	-0.05178 0.6635 73	0.10793 0.3634 73
VOCAB PIMSLEUR VOCABULARY SCALE - PRE	0.24183 0.0437 70	0.48628 0.0001 70	-0.04342 0.7153 73	-0.18812 0.1110 73

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0
/ NUMBER OF OBSERVATIONS

	D2TST1	D2TST2	D2TST3	D3TST1	D3TST2	D4TST1	D4TST2	D4TST3
D2TST1	1.00000	0.59755	0.36718	0.15283	0.62301	0.66267	0.51632	0.29385
	0.0000	0.0001	0.0026	0.2100	0.0001	0.0001	0.0001	0.0166
	72	70	65	69	69	66	66	66
D2TST2	0.59755	1.00000	0.27375	0.02252	0.70669	0.64137	0.56985	0.34460
	0.0001	0.0000	0.0273	0.8565	0.0001	0.0001	0.0001	0.0053
	70	70	65	67	67	64	64	64
D2TST3	0.36718	0.27375	1.00000	0.38902	0.32394	0.42851	0.31249	0.13089
	0.0026	0.0273	0.0000	0.0016	0.0096	0.0006	0.0151	0.3188
	65	65	65	63	63	60	60	60
D3TST1	0.15283	0.02252	0.38902	1.00000	0.07180	-0.08843	-0.17013	-0.11969
	0.2100	0.8565	0.0016	0.0000	0.5461	0.4802	0.1754	0.3423
	69	67	63	73	73	66	65	65
D3TST2	0.62301	0.70669	0.32394	0.07180	1.00000	0.66702	0.63091	0.29207
	0.0001	0.0001	0.0096	0.5461	0.0000	0.0001	0.0001	0.0182
	69	67	63	73	73	66	65	65
D4TST1	0.66267	0.64137	0.42851	-0.08843	0.66702	1.00000	0.71463	0.53081
	0.0001	0.0001	0.0006	0.4802	0.0001	0.0000	0.0001	0.0001
	66	64	60	66	66	69	68	68
D4TST2	0.51632	0.56985	0.31249	-0.17013	0.63091	0.71463	1.00000	0.34611
	0.0001	0.0001	0.0151	0.1754	0.0001	0.0001	0.0000	0.0038
	66	64	60	65	65	68	68	68
D4TST3	0.29385	0.34460	0.13089	-0.11969	0.29207	0.53081	0.34611	1.00000
	0.0166	0.0053	0.3188	0.3423	0.0182	0.0001	0.0038	0.0000
	66	64	60	65	65	68	68	68
D5TST1	0.50438	0.32279	0.35138	0.11995	0.47031	0.36044	0.45672	0.26999
	0.0001	0.0064	0.0041	0.3191	0.0001	0.0027	0.0001	0.0271
	71	70	65	71	71	67	67	67
D5TST2	0.34706	0.35095	0.09686	0.03242	0.40635	0.46397	0.39239	0.07173
	0.0030	0.0029	0.4427	0.7884	0.0004	0.0001	0.0010	0.5640
	71	70	65	71	71	67	67	67
D5TST3	0.50210	0.56101	0.27173	0.04566	0.58698	0.58582	0.50970	0.20823
	0.0001	0.0001	0.0286	0.7054	0.0001	0.0001	0.0001	0.0908
	71	70	65	71	71	67	67	67
D6TST1	0.53234	0.54323	0.34376	-0.05803	0.59415	0.61802	0.49047	0.23436
	0.0001	0.0001	0.0082	0.6514	0.0001	0.0001	0.0001	0.0766
	62	61	58	63	63	59	58	58
D6TST2	0.45062	0.42171	0.27086	-0.15108	0.50771	0.43021	0.41474	0.08759
	0.0002	0.0007	0.0397	0.2372	0.0001	0.0007	0.0012	0.5132
	62	61	58	63	63	59	58	58

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RH0=0
/ NUMBER OF OBSERVATIONS

	D2TST1	D2TST2	D2TST3	D3TST1	D3TST2	D4TST1	D4TST2	D4TST3
D6TST3	0.45240	0.52868	0.18682	-0.16030	0.46428	0.48263	0.43512	0.23488
	0.0002	0.0001	0.1603	0.2095	0.0001	0.0001	0.0006	0.0759
	62	61	58	63	63	59	58	58
D7TST1	0.59364	0.50882	0.25508	0.00965	0.59825	0.63727	0.59024	0.25549
	0.0001	0.0001	0.0454	0.9368	0.0001	0.0001	0.0001	0.0400
	69	67	62	70	70	66	65	65
D7TST2	0.49404	0.55813	0.22087	-0.00107	0.53156	0.56692	0.47668	0.40875
	0.0001	0.0001	0.0845	0.9930	0.0001	0.0001	0.0001	0.0007
	69	67	62	70	70	66	65	65
D8TST1	0.58289	0.54184	0.26897	-0.16946	0.57193	0.65874	0.59964	0.36193
	0.0001	0.0001	0.0361	0.1639	0.0001	0.0001	0.0001	0.0033
	68	66	61	69	69	65	64	64
D8TST2	0.27597	0.28207	0.28320	0.00468	0.32190	0.30436	0.31253	0.34214
	0.0261	0.0239	0.0297	0.9703	0.0084	0.0162	0.0142	0.0070
	65	64	59	66	66	62	61	61
D9TST1	0.33092	0.48004	0.30237	-0.13411	0.52656	0.59440	0.58832	0.23860
	0.0055	0.0001	0.0169	0.2684	0.0001	0.0001	0.0001	0.0556
	69	67	62	70	70	65	65	65
D9TST2	0.28074	0.35600	0.31057	-0.01836	0.30998	0.52623	0.36876	0.30304
	0.0195	0.0031	0.0140	0.8801	0.0090	0.0001	0.0025	0.0141
	69	67	62	70	70	65	65	65
D10TST1	0.32136	0.28390	0.12448	-0.06681	0.36549	0.36321	0.36416	0.22304
	0.0096	0.0241	0.3433	0.5969	0.0028	0.0043	0.0042	-0.0867
	64	63	60	65	65	60	60	60
D10TST2	0.64267	0.66878	0.17915	0.08543	0.66285	0.65911	0.60813	0.34006
	0.0001	0.0001	0.1708	0.5021	0.0001	0.0001	0.0001	0.0084
	63	63	60	64	64	59	57	59

	D5TST1	D5TST2	D5TST3	D6TST1	D6TST2	D6TST3	D7TST1	D7TST2
D2TST1	0.50438	0.34706	0.50210	0.53234	0.45062	0.45240	0.59364	0.49404
	0.0001	0.0030	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001
	71	71	71	62	62	62	69	69
D2TST2	0.32279	0.35095	0.56101	0.54323	0.42171	0.52868	0.50882	0.55813
	0.0064	0.0029	0.0001	0.0001	0.0007	0.0001	0.0001	0.0001
	70	70	70	61	61	61	67	67
D2TST3	0.35138	0.09686	0.27173	0.34376	0.27086	0.18682	0.25508	0.22087
	0.0041	0.4427	0.0286	0.0082	0.0397	0.1603	0.0454	0.0845
	65	65	65	58	58	58	62	62

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0
/ NUMBER OF OBSERVATIONS

	D5TST1	D5TST2	D5TST3	D6TST1	D6TST2	D6TST3	D7TST1	D7TST2
D3TST1	0.11995	0.03242	0.04566	-0.05803	-0.15108	-0.16030	0.00965	-0.00107
	0.3191	0.7884	0.7054	0.6514	0.2372	0.2095	0.9368	0.9930
	71	71	71	63	63	63	70	70
D3TST2	0.47031	0.40635	0.58698	0.59415	0.50771	0.46428	0.59825	0.53156
	0.0001	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	71	71	71	63	63	63	70	70
D4TST1	0.36044	0.46397	0.58582	0.61802	0.43021	0.48263	0.63727	0.56692
	0.0027	0.0001	0.0001	0.0001	0.0007	0.0001	0.0001	0.0001
	67	67	67	59	59	59	66	66
D4TST2	0.45672	0.39239	0.50970	0.49047	0.41474	0.43512	0.59024	0.47668
	0.0001	0.0010	0.0001	0.0001	0.0012	0.0006	0.0001	0.0001
	67	67	67	58	58	58	65	65
D4TST3	0.26999	0.07173	0.20823	0.23436	0.08759	0.23488	0.25549	0.40875
	0.0271	0.5640	0.0908	0.0766	0.5132	0.0759	0.0400	0.0007
	67	67	67	58	58	58	65	65
D5TST1	1.00000	0.16076	0.40049	0.26555	0.35999	0.31045	0.30445	0.25159
	0.0000	0.1712	0.0004	0.0339	0.0035	0.0125	0.0104	0.0356
	74	74	74	64	64	64	70	70
D5TST2	0.16076	1.00000	0.45550	0.36642	0.48965	0.38935	0.44130	0.40462
	0.1712	0.0000	0.0001	0.0029	0.0001	0.0015	0.0001	0.0005
	74	74	74	64	64	64	70	70
D5TST3	0.40049	0.45550	1.00000	0.68779	0.50162	0.62875	0.66263	0.57515
	0.0004	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
	74	74	74	64	64	64	70	70
D6TST1	0.26555	0.36642	0.68779	1.00000	0.45603	0.58482	0.61656	0.54613
	0.0339	0.0029	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
	64	64	64	66	65	65	64	64
D6TST2	0.35999	0.48965	0.50162	0.45603	1.00000	0.61281	0.52687	0.48406
	0.0035	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
	64	64	64	65	65	65	63	63
D6TST3	0.31045	0.38935	0.62875	0.58482	0.61281	1.00000	0.69019	0.54067
	0.0125	0.0015	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001
	64	64	64	65	65	65	63	63
D7TST1	0.30445	0.44130	0.66263	0.61656	0.52687	0.69019	1.00000	0.73526
	0.0104	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
	70	70	70	64	63	63	74	74
D7TST2	0.25159	0.40462	0.57515	0.54613	0.48406	0.54067	0.73526	1.00000
	0.0356	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000
	70	70	70	64	63	63	74	74

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0
/ NUMBER OF OBSERVATIONS

	D5TST1	D5TST2	D5TST3	D6TST1	D6TST2	D6TST3	D7TST1	D7TST2
D5TST1	0.34395	0.37462	0.52852	0.53695	0.45806	0.67692	0.76564	0.55207
	0.0038	0.0015	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
	69	69	69	63	62	62	71	71
D8TST2	0.38823	-0.02798	0.32891	0.35010	0.42067	0.37261	0.28332	0.21362
	0.0012	0.8222	0.0066	0.0057	0.0008	0.0034	0.0192	0.0803
	67	67	67	61	60	60	68	68
D9TST1	0.27537	0.38364	0.48678	0.43583	0.44706	0.34938	0.45309	0.44571
	0.0201	0.0010	0.0001	0.0004	0.0003	0.0058	0.0001	0.0001
	71	71	71	62	61	61	71	71
D9TST2	0.09632	0.36932	0.41551	0.30205	0.20133	0.36283	0.44838	0.35553
	0.4242	0.0015	0.0003	0.0170	0.1197	0.0041	0.0001	0.0023
	71	71	71	62	61	61	71	71
D10TST1	0.18667	0.34722	0.32393	0.28048	0.10098	0.22931	0.34223	0.34042
	0.1334	0.0043	0.0080	0.0314	0.4512	0.0834	0.0046	0.0048
	66	66	66	59	58	58	67	67
D10TST2	0.41188	0.43807	0.61357	0.63072	0.44072	0.55746	0.69497	0.59333
	0.0006	0.0002	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001
	66	66	66	59	58	58	66	66

	D8TST1	D8TST2	D9TST1	D9TST2	D10TST1	D10TST2
D2TST1	0.58289	0.27597	0.33092	0.28074	0.32136	0.64267
	0.0001	0.0261	0.0055	0.0195	0.0096	0.0001
	68	65	69	69	64	63
D2TST2	0.54184	0.28207	0.48004	0.35600	0.28390	0.66878
	0.0001	0.0239	0.0001	0.0031	0.0241	0.0001
	66	64	67	67	63	63
D2TST3	0.26897	0.28320	0.30237	0.31057	0.12448	0.17915
	0.0361	0.0297	0.0169	0.0140	0.3433	0.1708
	61	57	62	62	60	60
D3TST1	-0.16946	0.00468	-0.13411	-0.01836	-0.06681	0.08543
	0.1639	0.9703	0.2684	0.8801	0.5969	0.5021
	69	66	70	70	65	64
D3TST2	0.57193	0.32190	0.52656	0.30998	0.36549	0.66285
	0.0001	0.0084	0.0001	0.0090	0.0028	0.0001
	69	66	70	70	65	64
D4TST1	0.65874	0.30436	0.59440	0.52623	0.36321	0.65911
	0.0001	0.0162	0.0001	0.0001	0.0043	0.0001
	65	62	65	65	60	59

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0
/ NUMBER OF OBSERVATIONS

	D8TST1	D8TST2	D9TST1	D9TST2	D10TST1	D10TST2
D4TST2	0.59964	0.31253	0.58832	0.36876	0.36416	0.60813
	0.0001	0.0142	0.0001	0.0025	0.0042	0.0001
	64	61	65	65	60	59
D4TST3	0.36193	0.34214	0.23860	0.30304	0.22304	0.34006
	0.0033	0.0070	0.0556	0.0141	0.0867	0.0084
	64	61	65	65	60	59
D5TST1	0.34395	0.38823	0.27537	0.09632	0.18667	0.41188
	0.0038	0.0012	0.0201	0.4242	0.1334	0.0006
	69	67	71	71	66	66
D5TST2	0.37462	-0.02798	0.38364	0.36932	0.34722	0.43807
	0.0015	0.8222	0.0010	0.0015	0.0043	0.0002
	69	67	71	71	66	66
D5TST3	0.52852	0.32891	0.48678	0.41551	0.32393	0.61357
	0.0001	0.0066	0.0001	0.0003	0.0080	0.0001
	69	67	71	71	66	66
D6TST1	0.53695	0.35010	0.43583	0.30205	0.28048	0.63072
	0.0001	0.0057	0.0004	0.0170	0.0314	0.0001
	63	61	62	62	59	59
D6TST2	0.45806	0.42067	0.44706	0.20133	0.10088	0.44072
	0.0002	0.0008	0.0003	0.1197	0.4512	0.0005
	62	60	61	61	58	58
D6TST3	0.67692	0.37261	0.34938	0.36283	0.22931	0.55746
	0.0001	0.0034	0.0058	0.0041	0.0834	0.0001
	62	60	61	61	58	58
D7TST1	0.76564	0.28332	0.45309	0.44838	0.34223	0.69497
	0.0001	0.0192	0.0001	0.0001	0.0046	0.0001
	71	68	71	71	67	66
D7TST2	0.55207	0.21362	0.44571	0.35553	0.34042	0.59333
	0.0001	0.0803	0.0001	0.0023	0.0048	0.0001
	71	68	71	71	67	66
D8TST1	1.00000	0.32374	0.43575	0.37658	0.26289	0.66362
	0.0000	0.0063	0.0002	0.0013	0.0344	0.0001
	73	70	70	70	65	64
D8TST2	0.32374	1.00000	0.27741	0.07903	-0.05779	0.24045
	0.0063	0.0000	0.0230	0.5250	0.6555	0.0598
	70	70	67	67	62	62
D9TST1	0.43575	0.27741	1.00000	0.39022	0.23640	0.38502
	0.0002	0.0230	0.0000	0.0006	0.0541	0.0014
	70	67	74	74	67	66
D9TST2	0.37658	0.07903	0.39022	1.00000	0.31893	0.39480
	0.0013	0.5250	0.0006	0.0000	0.0085	0.0010
	70	67	74	74	67	66
D10TST1	0.26289	-0.05779	0.23640	0.31893	1.00000	0.41367
	0.0344	0.6555	0.0541	0.0085	0.0000	0.0005
	65	62	67	67	69	68
D10TST2	0.66362	0.24045	0.38502	0.39480	0.41367	1.00000
	0.0001	0.0598	0.0014	0.0010	0.0005	0.0000
	64	62	66	66	68	68

TABLE 7

Daily Test Clusters

SAS

OBLIQUE PRINCIPAL COMPONENT CLUSTER ANALYSIS

41 OBSERVATIONS PROPORTION = 0.000000
22 VARIABLES MAXEIGEN = 1.0000

ORTHOBLIQUE INITIALIZATION

CLUSTER SUMMARY FOR 4 CLUSTERS

CLUSTER	MEMBERS	CLUSTER VARIATION	VARIATION EXPLAINED	PROPORTION EXPLAINED	SECOND EIGENVALUE
1	10	10.000000	6.250279	0.6250	1.000548
2	3	3.000000	1.805233	0.6017	0.647090
3	1	1.000000	1.000000	1.0000	
4	8	8.000000	4.926758	0.6158	0.871826

TOTAL VARIATION EXPLAINED = 13.98227 PROPORTION = 0.635558

	VARIABLE	R-SQUARED WITH OWN CLUSTER	R-SQUARED WITH NEXT HIGHEST	R**2 RATIO
CLUSTER	1			
	D2TST2	0.6762	0.5550	0.8207
	D5TST3	0.6900	0.4752	0.6887
	D6TST1	0.6626	0.4533	0.6841
	D6TST2	0.5527	0.3040	0.5500
	D6TST3	0.7089	0.3173	0.4477
	D7TST1	0.7618	0.4736	0.6217
	D7TST2	0.5848	0.4446	0.7603
	D8TST1	0.7050	0.5341	0.7575
	D8TST2	0.2448	0.1872	0.7646
	D10TST2	0.6634	0.4415	0.6656
CLUSTER	2			
	D5TST2	0.6481	0.2072	0.3196
	D9TST2	0.5895	0.1831	0.3107
	D10TST1	0.5676	0.0960	0.1692
CLUSTER	3			
	D3TST1	1.0000	0.0183	0.0183
CLUSTER	4			
	D2TST1	0.7163	0.6321	0.8825
	D2TST3	0.5355	0.2657	0.4962
	D3TST2	0.7451	0.5819	0.7810
	D4TST1	0.8527	0.6261	0.7343
	D4TST2	0.6973	0.4946	0.7094
	D4TST3	0.3226	0.1279	0.3964
	D5TST1	0.5934	0.3382	0.5700
	D9TST1	0.4640	0.2493	0.5373

The achievement tests tests which clustered together, above, are: for Day 2 (tests 1 and 3), Day 3 (test 2), and Day 4 (tests 1 and 2). Three of these tests involve matching vocabulary items from a list with blanks in sentences from the lesson, one is a multiple-choice comprehension exercise based on English translations of sentences from the lesson, and the fifth requires the student to identify which one of three similar Spanish sentences make sense. It appears clear that statistically similar performance on these five tests was due to the similar nature of the task: all of the tests require global understanding of the meaning of the sentences, rather than focusing on any particular structure they might contain. Since clustering tends to be an indication of test reliability, these findings suggest the advisability of using these types of tests when integrative testing is desired.

APPENDICES

APPENDIX E

Description of the Pimsleur Language Aptitude Battery *

The Pimsleur Language Aptitude Battery (PLAB), developed for use in Grades 7-12, containes five subtests to assess different aspects of language aptitude. These subtests and a description of the specific ability (ies) each is designed to test are as follows (Pimsleur, 1966).

1. Interest in learning a foreign language: designed to give an indication of a student's motivation.
2. Vocabulary: word knowledge in English; designed, along with the next section on language analysis , to provide information regarding a student's verbal ability and his ability to handle the mechanics of a foreign language.
3. Language analysis: ability to reason logically in terms of a foreign language.
4. Sound discrimination: ability to learn new phonetic distinctions and to recognize them in different contexts; designed to test the student's ability to hear and retain new sounds.
5. Sound-symbol association: an association of sounds with their written symbols; designed to measure a student's ability to associate English-lanuage sounds with their written symbols.

* Extracted from Robinson, 1981
In the present study only subtests 2-5 were used.

APPENDIX A:

(CAI) Student Background Questionnaire: Pre-Test Responses: Means, Frequencies, Percentages

MISSING DATA CODE =99
UNUSABLE DATA CODE =98

		CODE	FREQUENCY (N)	PERCENT %
GENDER:	Male	=1	50	60 %
	Female	=2	33	40 %
STUDENT ETHNICITY:	Black	=1	18	24 %
	Caucasian/White	=2	36	49 %
	Asian	=3	11	15 %
	Other	=4	7	9 %
		99	2	3 %

OCCUPATION CODE:

Professional	=1
Blue Collar	=2
Business/Sales	=3
Service	=4
Other	=5

FATHER'S OCCUPATION	=1	40	54 %
	=2	10	14 %
	=3	9	12 %
	=4	6	8 %
	=5	5	7 %
	99	4	5 %
MOTHER'S OCCUPATION	=1	23	31 %
	=2	2	3 %
	=3	6	8 %
	=4	18	24 %
	=5	16	22 %
	98	1	1 %
	99	8	11 %

(PLEASE FILL-IN OR CIRCLE YOUR ANSWERS, AS INDICATED.)

Q.#1: PLACE OF BIRTH:_____
CITY/TOWN STATE COUNTRY

Q.#2: WHAT OTHER FOREIGN LANGUAGES (BESIDES SPANISH) HAVE YOU FORMALLY STUDIED ?

	CODE	FREQUENCY (N)	PERCENT %
Greek....	=1	3	4 %
Portugese	=2	1	1 %
French...	=3	7	10 %
Chinese..	=5	7	10 %
Japanese.	=6	1	1 %
Hebrew...	=7	1	1 %
Other....	=8	3	4 %
	99	51	69 %

Q.#3: WHAT SPANISH COURSES HAVE YOU TAKEN BEFORE THIS ONE ?

Level A		63	85 %
Level B		63	85 %
Level 1		21	28 %

Q.#4: WHAT LANGUAGES OTHER THAN (OR BESIDES) ENGLISH DO YOU OR YOUR FAMILY SPEAK AT HOME ?

YOU SPEAK:

Greek....	=1	3	4 %
French...	=3	1	1 %
Spanish..	=4	9	12 %
Chinese..	=5	5	7 %
Japanese.	=6	1	1 %
Other....	=8	2	3 %
	99	53	72 %

FAMILY SPEAKS:

Greek....	=1	3	4 %
French...	=3	1	1 %
Spanish..	=4	9	12 %
Chinese..	=5	7	10 %
Japanese.	=6	2	3 %
Hebrew...	=7	1	1 %
Other....	=8	4	5 %
	99	47	64 %

Q.#5: HAVE YOU HAD ANY MUSICAL TRAINING ?

CODE	FREQUENCY (N)	PERCENT %
YES =1	60	81 %
NO =2	14	19 %

Q.#6: IF YES, HOW LONG ? MEAN=3.5 Yrs., N=59

Q.#7: HOW MANY TIMES HAVE YOU HAD EXPERIENCE (USED OR PLAYED) WITH A COMPUTER ? Circle:

2-10 x's	=1	10	12 %
10-20 x's	=2	10	12 %
20-30 x's	=3	9	11 %
1 month	=4	9	11 %
2-6 months	=5	6	7 %
7-12 months	=6	4	5 %
1-2 years	=7	12	14 %
2 yrs.+ more	=8	14	17 %
	99	9	11 %

Q.#8: THE TIMES YOU HAVE USED THE COMPUTER, WHAT WERE THE MAIN REASONS (INCLUDING GAMES) FOR USING THE COMPUTER ?

Games (playing)	=1	42	57 %
Programming	=2	6	8 %
Word Processing	=3	6	8 %
Learning/Educational	=4	13	18 %
Other	=5	7	9 %

Q.#9: HOW INTERESTED ARE YOU IN USING COMPUTERS ?

MEAN=3.2
N =73

Very Little	=1	2	3 %
	=2	7	10 %
	=3	35	47 %
Very Much	=4	29	39 %
	98	1	1 %

Q.#10: WHAT INTERESTS YOU THE MOST ABOUT COMPUTERS ?

	CODE	FREQUENCY (N)	PERCENT %
Games	=1	10	12 %
Programming	=2	10	12 %
Graphics	=3	5	6 %
Ease of use	=4	24	29 %
Word Processing	=5	4	5 %
Nothing	=6	2	2 %
Other	=7	14	17 %
Job Skill	=8	1	1 %
Indiv. Instruction.	=9	4	5 %
	99	9	11 %

Q.#11: WHAT INTERESTS YOU THE LEAST ABOUT COMPUTERS ?

Boring	=1	2	3 %
Programming	=2	9	12 %
Confusing	=3	4	5 %
Nothing	=4	12	16 %
Impersonal Machine	=5	4	5 %
Operation/ Mechanics.	=6	20	27 %
Other	=7	5	7 %
	99	18	24 %

Q.#12: DO YOU KNOW HOW TO TYPE ?

Yes	55	66 %
No	19	23 %
99	9	11 %

Q.#13: IF YES, HOW LONG ? MEAN=7 Months, N=59

Q.#14: HOW INTERESTED ARE YOU IN LEARNING SPANISH ?

MEAN=2.8
N =74

Not at All	=1	7	8 %
	=2	18	22 %
	=3	33	40 %
Very Interested.	=4	16	19 %
	99	9	11 %

Q.#15: HOW MUCH DO YOU ENJOY SPANISH IN COMPARISON TO OTHER SUBJECTS ?

MEAN=2.3
N =74

	CODE	FREQUENCY (N)	PERCENT %
Least Favorite Subject	=1	13	16 %
	=2	32	39 %
	=3	24	29 %
Most Popular Subject	=4	5	6 %
	99	9	11 %

Q.#16: WHAT IS YOUR MOST IMPORTANT REASON FOR STUDYING SPANISH ?

Language learning	=1	18	22 %
Travel	=2	6	7 %
Credits:College/HS	=3	20	24 %
Jobs; Work	=4	7	8 %
Learn about people	=5	2	2 %
No reason	=6	1	1 %
Communicate/people	=7	10	12 %
Other	=8	10	12 %
	99	9	11 %

Q.#17: WHAT ARE YOUR GENERAL IMPRESSIONS OF SPANISH-SPEAKING PEOPLE ?

MEAN=2.2
N =61

Negative	=1	10	13 %
Neutral	=2	29	38 %
Positive	=3	22	29 %
	99	13	17 %
	98	3	4 %

Q.#18: WHAT COUNTRY DO YOU THINK THE PEOPLE YOU ARE TALKING ABOUT COME FROM ?

Mexico	=1	26	35 %
Spain	=2	36	49 %
South America	=3	3	4 %
Central America	=4	1	1 %
Other	=5	1	1 %
	99	6	8 %
	98	1	1 %

Q.#19: HAVE YOU EVER MET OR SPOKEN TO SOMEONE WITH A SPANISH ACCENT ?

	CODE	FREQUENCY (N)	PERCENT %
YES.....	=1	63	85 %
NO.....	=2	9	12 %
	99	2	3 %

Q.#20: IF YES, WHERE WAS HE OR SHE FROM ?

Mexico.....	=1	29	39 %
Spain.....	=2	4	5 %
South America...	=3	6	8 %
Central America.	=4	2	3 %
United States...	=5	10	14 %
Other.....	=6	1	1 %
	99	22	30 %

Q.#21: WHAT WERE YOUR PARTICULAR IMPRESSIONS OF THAT PERSON ?

MEAN=2.6
N =55

Negative.....	=1	2	3 %
Neutral.....	=2	18	24 %
Positive.....	=3	35	47 %
	99	1	1 %
	98	18	24 %

In this section we want you to tell us if you agree or disagree with some statements about Spanish-speaking people. Circle the number that corresponds to your opinion.

(ATTITUDES TOWARD SPANISH SPEAKERS)

Q.#22: SPANISH SPEAKERS ARE FRIENDLY.

MEAN=3.2 N =58	CODE	(N)	FREQUENCY PERCENT %
Totally Disagree	1	1	2 %
	2	10	17 %
	3	42	72 %
Totally Agree	4	5	9 %

Q.#23: I WOULD LIKE TO HAVE SPANISH SPEAKING FRIENDS.

MEAN=3.1 N =65	CODE	(N)	FREQUENCY PERCENT %
Totally Disagree	1	0	0 %
	2	8	12 %
	3	43	66 %
Totally Agree	4	14	22 %

Q.#24: SPANISH SPEAKERS DON'T TALK RIGHT.

MEAN=1.5 N =70	CODE	(N)	FREQUENCY PERCENT %
Totally Disagree	1	41	59 %
	2	21	30 %
	3	7	10 %
Totally Agree	4	1	1 %

Q.#25: SPANISH SPEAKERS ARE INTELLIGENT.

MEAN=2.7 N =59	CODE	(N)	FREQUENCY PERCENT %
Totally Disagree	1	3	5 %
	2	17	29 %
	3	36	61 %
Totally Agree	4	3	5 %

Q.#26: SPANISH SPEAKERS ARE LAZY.

MEAN=1.6 N =62	CODE	FREQUENCY (N)	PERCENT %
Totally Disagree	1	30	48 %
	2	29	47 %
	3	2	3 %
Totally Agree	4	1	2 %

Q.#27: I WOULD LIKE TO VISIT A SPANISH SPEAKING COUNTRY.

MEAN=3.5 N =71	CODE	FREQUENCY (N)	PERCENT %
Totally Disagree	1	1	1 %
	2	7	10 %
	3	21	30 %
Totally Agree	4	42	59 %

Q.#28: SPANISH SPEAKERS ARE WELL LIKED IN SCHOOL.

MEAN=2.4 N =56	CODE	FREQUENCY (N)	PERCENT %
Totally Disagree	1	4	7 %
	2	25	45 %
	3	25	45 %
Totally Agree	4	2	4 %

(MOTIVATION)

Q.#29: LEARNING SPANISH WILL HELP ME GET A BETTER JOB.

MEAN=3.1 N =65	CODE	FREQUENCY (N)	PERCENT %
Totally Disagree	1	4	6 %
	2	9	14 %
	3	27	42 %
Totally Agree	4	25	38 %

Q.#30: I WANT TO LEARN SPANISH TO USE IN TRAVEL.

MEAN=3.3 N =71	CODE	FREQUENCY (N)	PERCENT %
Totally Disagree	1	3	4 %
	2	8	11 %
	3	28	39 %
Totally Agree	4	32	45 %

STATISTICALLY SIGNIFICANT GAIN SCORES OBTAINED FROM PRE-POST QUESTIONNAIRE: INTEGRATIVE MOTIVATION
(Items #31 and #32, combined)

Q.#31: I WANT TO LEARN SPANISH IN ORDER TO MAKE NEW FRIENDS WITH SPANISH SPEAKERS IN THIS COUNTRY.

Q.#32: I AM STUDYING SPANISH SO I CAN UNDERSTAND MORE ABOUT SPANISH-SPEAKING PEOPLE AND THEIR CULTURE.

COMBINED GAIN SCORE FOR ABOVE ITEMS: =1.14 (N)=73 P= .03 level

APPENDIX B: DESCRIPTION OF CAI MATERIALS

Day 1

Although students were given nine days of instructional material, there were actually 10 days of computer activities. The first day consisted of a computer orientation exercise developed especially for the project. The commercial "Apple Presents Apple" introductory program was considered, but was found to contain several uses of the keys in ways which conflicted with the usage of the project programs. The day 1 orientation provided a tutorial-type practice in using the RETURN key, back-space, special Spanish characters, plus an introduction to several of the special formats which students would encounter on subsequent days, such as cloze activites and DASHER-type feedback.

Day 2

Hypothesis: Known other vs. anonymous other

New item: Reflexive with SE (third person singular)

New vocab:	afeitadora	afeitarse	barba
	cuarto de baño	espejo	levantarse
	llamarse	mirarse	vanidoso

Teaching strategy:

Experimental group: Students are first asked to type in the names of their favorite male TV or movie star and their favorite male singer. These names are then used by the program as key characters in the activities which follow. New material is introduced in a narrative concerning the daily life of these famous people, with visuals to aid in comprehension. This narrative is followed by a multiple-choice comprehension exercise, in which the student guesses the English meaning of key sentences. Finally, the students complete a cloze exercise in which they reconstruct part of the narrative.

Control group: The control exercise is identical except that instead of using names chosen by the students, or even names of famous people whom they know, the narrative is about the anonymous Roberto and María.

Example: Experimental Group

"Estamos en la casa de otra persona muy popular. La persona se llama Prince. Prince trabaja por la noche. Por eso, se levanta muy tarde. Va al cuarto de baño. Es muy vanidoso también. Por eso, se mira mucho en el espejo."

[Translation: We are in the house of another very popular person. The person's name is Prince. Prince works at night. So he gets up very late. He goes to the bathroom. He is also very vain. For this reason, he looks at himself in the mirror a lot.]

1. ¿Dónde estamos? [Where are we?]
2. ¿Es vanidoso? [Is he vain?]
3. ¿A dónde va Prince? [Where does Prince go?]

Example: Control Group

"Estamos en la casa de otra persona muy popular. La persona se llama Manuel Ortega. Manuel trabaja por la noche. Por eso, se levanta muy tarde. Va al cuarto de baño. Es muy vanidoso también."

[Translation is exactly as above, with Manuel Ortega substituted every time the name "Prince" appears.]

Day 3

Hypothesis: Answer-judging hypothesis 2 (Student discovery)

New vocab:	cepillarse	comedor	desayuno
	lavarse	peinarse	preferir
	sentarse		

Teaching strategy:

Both groups: Presentation and type of activities are similar to the experimental version of day 2, although new vocabulary and grammatical items are introduced. However, four different types of answer-judging routines are used as feedback on the multiple-choice exercises:

Group 1: Correct answer only

After the first mistrial, the program responds with "Wrong, try again." After the second mistrial, the correct answer is given.

Group 2: Correct answer with explanation

After the first mistrial, the program responds with "Wrong, try again." After the second mistrial, the correct answer is given, along with an explanatory comment such as "The verb cepillarse means to brush."

Group 3: Location of error only

After the first mistrial, the program identifies the part of the student's chosen answer which is in error by displaying the corresponding sentence with blank spaces for the wrong part. This routine is repeated after the second mistrial; then, following a pause, the correct answer is given.

Group 4: Location of error with graded hints

After both first and second mistrials, the program locates the error by blanking out the incorrect part of the corresponding sentence, then gives a hint to help the student out ("She washes something but it isn't the sink."). The content of this hint varies according to which incorrect sentence the student has chosen.

Example:

Students are shown the graphic of a girl brushing her teeth, and the sentence, "Luego, se cepilla los dientes."
[Then she brushes her teeth.] They are given three English sentences following, and are asked to select the correct translation. For this sentence, the three choices were:

a. After, she brushes her hair.
b. After, she brushes her teeth.
c. After, she washes her teeth.

For all groups, if the correct answer was given on the first try, the computer responded, "Muy bien. She brushes her teeth."

Group 1: After first mistrial, "Wrong, try again."

After second mistrial, "Answer: B. She brushes her teeth."

Group 2: After first mistrial: "Wrong, try again."

After second mistrial, "Answer: B. She brushes her teeth. The verb cepillarse means to brush."

Group 3: After first mistrial, then error location, Dasher type:

If student gave answer (a), then:
She brushes - - - - - - - -

If student gave answer (c), then:
She - - - - - - - - her teeth.

After second mistrial, if (a or c), then error location as above, with "Do you want the correct answer or the next item?"

If correct answer, then the response was: "Answer: B. She brushes her teeth."

Group 4: After first mistrial, if (a) then error location: " She brushes - - - - - - - - - - -. Hint: She brushes something but it isn't her hair."

After first mistrial, if (c) then error location:" She - - - - - - - her teeth. Hint: She does something to her teeth, but it isn't washes."

After second mistrial, if (a), then as above.

After second mistrial, if (c), then as above.

Day 4

Hypothesis: Integrated material vs. non-integrated material

New item: Use of reflexive pronoun (se) with plural verb forms

Review: Telling time

New vocab: bañarse acostarse desayunar
abrigo colegio

Teaching strategy:

Experimental group: New forms and vocabulary are presented by means of an integrated context consisting of a reading passage about two junior high school girls in Spain, Rosi and Gabriela. The passage is given a title ("La vida diaria de Rosi y Gabriela"), follows a chronological sequence, and uses the same names throughout. Text is accompanied by visuals on the graphics screen to assure comprehension.

Follow-up practice is also integrated: multiple choice questions about the meaning of key sentences from the passage, and a cloze exercise in which students reconstruct key sentences from the passage.

Control group: The same new forms and vocabulary are presented by means of a series of unconnected scenes, following no sequence and using several different and unrelated characters and names. Follow-up practice consists of multiple-choice questions about the meaning of key sentences from the presentation, and a cloze exercise in which students reconstruct these unrelated sentences.

Example: Experimental group
[The following is an excerpt from Day 4's activities]
Each concept was accompanied by an explanatory graphic.

"La vida diaria de Rosi y Gabriela"

"Estas dos chicas viven en Burgos, una ciudad en Espana. Se llaman Rosi y Gabriela. Son hermanas. Rosi tiene 13 años. Gabriela tiene 15....Las hermanas se levantan a las seis y media. A las siete menos cuarto, se bañan. Después, se ponen el uniforme....Se ponen el abrigo para salir, porque hace frío en

Burgos....Por la noche, Rosi y Gabriela se cepillan los dientes."

[Translation: The Daily Life of Rosi and Gabriela
These two girls live in Burgos, a city in Spain. Their names are Rosi and Gabriela. They are sisters. Rosi is 13 years old. Gabriela is 15....The sisters get up at six thirty. At quarter to seven they take a bath. Afterwards, they put on their uniforms....They put on their coats to go out, because it is cold in Burgos....At night, Rosi and Gabriela brush their teeth."

The section following this "story" gives the students the same sentences, one or two at a time, and asks the students to choose the English sentence among 3 choices which gives the closest translation of the story line.

Example: Control group

In the non-integrated version of this activity, the students were given the following sentences to learn the same material: Again, the sentences are accompanied by graphics illustrating the activities described.

"Rosi y Gabriela se ponen la ropa para ir a la escuela.
Los hombres se levantan a las seis y media.
Roberto y su hermano se bañan por la noche.
Los chicos se ponen el abrigo para salir.
Por la noche, las muchachas se cepillan los dientes."

[Translation]

"Rosi and Gabriela get dressed to go to school.
The men get up at six thirty.
Roberto and his brother take a bath at night.
The children put on their coats to go out.
At night, the girls brush their teeth."

Following these sentences, the students were asked to complete parallel exercizes as for the experimental group.

Day 5

Hypothesis: Emotion (humor) vs. non-emotion

New item: Reflexive ME (recognition/production), TE (recognition)

New vocab:				
	anuncio	limpiarse	champán	pensar
	chiste	sofá	cuchillo	cepillo
	sopa	pelo	pijama	jamón
	champú	jabón		

Teaching strategy:

Experimental group: New forms and vocabulary are presented

in the context of a humorous dialog concerning two boys who are making up "commercials" about toothpaste and shampoo, etc. Follow-up practice consists of having students answer similar silly questions about themselves. Answers are in the form of complete sentences in which the forms of the verb and the reflexive pronoun are checked for feedback by the program.

Control group: Presentation is also in the form of a dialog between two boys. This time, however, the dialog is entirely lacking in (intentional) humorous content, since the boys are merely asking each other what they use to brush their teeth, etc. Practice is the same as for the experimental group, except that the questions are matter-of-fact.

Example: Experimental group

For the experimental group, the day's activities started with the following questions, accompanied by graphics, illustrating the subject, (the questions were briefly answered in a conversational way)

?Te lavas el pelo con champú o con champán?
[Do you wash your hair with shampoo or champagne?]

?Y te lavas con jamón o con jabón?
[And do you wash with jam or with soap?]

?Y te sientas en el sofá o en la sopa?
[Do you sit down on the sofa or on soap?]

Example: Control group

The control group, (non-humorous) had two boys talking together, with one boy interviewing the other, asking questions such as the following:

?Te lavas el pelo con champú?
[Do you wash your hair with shampoo?]

?Te bañas con agua caliente?
[Do you bathe with hot water?]

?Te sientas en el sofa para ver la televisión?
[Do you sit on the sofa to watch television?]

Day 6 (Activity 6a)

Hypothesis: Answer-judging hypothesis 5 (recycling of missed items)

New item: Choosing the right reflexive pronoun (me/te/se)

Review item: Weather terms with HACER

NEW VOCAB: quitarse suéter zapatos
gafas de sol impermeable

Teaching strategy:

Both groups: New material is presented by means of visuals with text commenting on the particular types of clothing which are worn in different kinds of weather. Practice for all groups consists of a fill-in exercise requiring the students to type in the correct form of the verbs PONER or QUITAR and the appropriate reflexive pronoun (ME, TE, or SE). Treatments differ only in the form of answer-judging/error feedback.

Answer-judging groups differ in the manner in which missed material is recycled. Treatment after the first mistrial is identical for all four groups: the program responds with " Cómo?" and the student tries again. After the second mistrial, the correct answer is given. If missed again, the missed form is then recycled in four different ways:

AJ group 1: Immediate repetition of same item.

The same item is repeated immediately following the second mistrial.

AJ group 2: Immediate repetition of parallel item.

A parallel item (same form, different context) is given following the second mistrial.

AJ group 3: Repetition of missed items together at the end.

Missed items are stored, then repeated at the end of the exercise.

AJ group 4: Repetition of missed items at random intervals.

Missed items are stored and repeated at random intervals during the exercise.

Activity 6b

Hypothesis: Problem-solving activity vs. non-problem-solving

New items: Locative prepositions

New vocab: delante de/detrás de dentro de entre
debajo de/encima de
---
bicicleta

Teaching strategy:

Both groups: The computer "draws" a picture of a house,

identifying each new object as it is drawn by means of a sentence with a locative preposition ("La bicicleta está delante del árbol"). [The bicycle is under the tree.] This is followed by a set of true-false comprehension questions on the location of the objects.

Experimental group: The picture is now scrambled and the student is given the problem of unscrambling by answering multiple choice questions about where the objects should appear. Providing the correct answers causes the object to return to its proper place.

Control group: The picture is as before. The student must merely answer multiple-choice questions concerning the location of the objects. There is no problem to solve, only straightforward questions to answer.

Example: Experimental Group

The students in this group were shown a scrambled picture for this activity, with all the same objects that had appeared in the original picture, but now all in different places (the dog on top of the house, the plane under the tree, the car behind the house). By selecting the correct answer to a multiple-choice question, the student makes the object appear in its correct location.

"1. El carro debe estar... [the car should be...]
   a. ...detrás de la casa [behind the house]
   b. ...delante de la casa [in front of the house]
   c. ...encima de la casa [on top of the house]"

Example: Control Group

The students are shown the same picture as before, and asked to select the sentence which describes the correct location of each object:

"1. El carro está...[The car is...]
   a. ...detrás de la casa [behind the house]
   b. ...delante de la casa [in front of the house]
   c. ...encima de la casa [on top of the house]

Day 7

Hypothesis: Meaningful practice vs. manipulative practice

New item: Stem-changing verbs in the reflexive

Review: Reflexive ME/TE/SE
Non-reflexive stem-changing verbs

New vocab: divertirse divertido dormirse
despertarse rápidamente grave

Teaching strategy:

The hypothesis being tested here is meaningful practice vs. communicative practice. The format of the follow-up practice is varied for the two groups (questions on meaning vs. drill on forms). Note that in designating the practice here as "meaningful" rather than "communicative" we are following the distinction made by Paulston (see Section 1.2).

Experimental group: New forms and vocabulary are presented by means of a dialog between schoolmates regarding the problem one of them is having: he keeps falling asleep in the algebra class. The dialog is accompanied by the usual visuals to aid comprehension. There follows a brief tutorial on the forms of stem-changing verbs, including a review practice on stem-changing forms which the students had already studied. The final practice consists of a set of true-false comprehension questions based on the communicative content of the passage.

Control group: The same forms and vocabulary are presented by means of uncontextualized sentences accompanied by visuals. Following the tutorial practice (as above), students are given a manipulative drill (no choice of verb) on the stem-changing verbs from the sentences.

While the above presentation is somewhat similar to Day 4 (integrated vs. non-integrated sentences), the format of the follow-up practice differs as noted above, (questions on meaning vs. drill on forms).

Example: Experimental Group

"Roberto: Tengo problemas con mis clases.
Rosi: ?Qué pasa?
Roberto: Me siento en la clase de algebra, y !pum! !me duermo!
Rosi: !Te duermes en la clase!
Roberto: Sí. Me despierto al final, cuando termina la clase."

[Translation:
Roberto: I'm having problems with my classes.
Rosi: What's the matter?
Roberto: I sit down in algebra class, and boom! I fall asleep.
Rosi: You fall asleep in class!
Roberto: Yes. I wake up at the end, when the class is over.]

Example: Control Group

"Me siento en la clase de español."
"Roberto se acuesta en la cama."
"Tu no te duermes en la clase."

"Me divierto mucho en la clase de música."
"Yo me acuesto a las doce."

[Translation:
"I sit down in Spanish class."
"Roberto goes to bed in his bed."
"You don't fall sleep in class."
"I have a good time in music class."
"I go to bed at twelve."]

Day 8

Hypothesis: Answer-judging hypothesis 3 (program-controlled feedback vs. student-controlled help)

New item: Regular preterite (-AR): singular only (non-reflexive)

New vocab:

bicicleta	anoche	béisbol
cenar	conversar	gastar

Teaching strategy:

All groups: Regular preterite forms are first introduced by means of a tutorial which points out the various forms and elicits responses from the students to confirm their understanding of and attention to these forms. The past tense forms are then practiced in a reconstruction activity involving the extraction of information from a chart, followed by question and answer practice in which the student must type in a complete sentence. The program checks for mistakes either in the form of the preterite verb or the sense of the sentence.

Four different types of feedback are used when the student makes a mistake, differing primarily in the amount of control the student has over the type of help that is given:

Group 1: No help - programmed correct answer.

The program gives the correct answer and instructs the student to type it in again.

Group 2: Total program-controlled help

The program automatically displays a help screen with hints related to the type of error the student has made; after looking at this screen, the student may try again.

Group 3: Combined program and student-controlled help

After each mistrial, the student may try again without help or

seek help by pressing the "escape" key. After the student requests help, the program automatically calls up the help screen pertinent to the particular error made, and allows the student to retype the response again.

Group 4: Total student-controlled help

The student may try again, or seek help by pressing the "escape" key, which calls up a "help menu." From this menu students may then choose the type of help screen they feel they need -- e.g. Do you want to review the vocabulary? the grammar? the story etc. --- and retype the response again.

SAMPLE INFORMATION CHART

	"Tú"	Susie
escuela	Montera	McChesney
la hora que cena	a las 6	a las 5:30
refresco que toma	Coca-Cola	Pepsi
gasta el dinero	en la tienda	en el cine
estudia	español	matemáticas
actividad el sábado	visita con amigos	trabaja

Sample questions based on chart:
[Practice on verbs in the preterite]

1. ?Qué tomaste tú ayer? [What did you drink yesterday?]
2. ?A qué hora cenó Susie? [What time did Susie eat dinner?]
3. ?Quién estudió en Montera ayer? [Who studied at Montera yesterday?]
4. ?Dónde gastó Susie el dinero ayer? [Where did Susie spend her money yesterday?]
5. ?A qué hora cenaste tú ayer? [What time did you eat dinner yesterday?]

Vocabulary Screen for Day 9

cenar	to eat dinner
conversar	to talk
estudiar	to study
gastar	to spend

terminar	to finish
tomar	to drink, take
trabajar	to work
visitar	to visit
anoche	last night
ayer	yesterday
béisbol	baseball
bicicleta	bicycle
dinero	money
refresco	soft drink
sábado	Saturday
tarde	late
tienda	store

Sample of Helpscreen:
(The question appears with its English translation), i.e.

"?Qué tomaste tú ayer?
What did you drink yesterday?"

Helpscreen with "yo" [I] verb forms:

La forma "yo" de los verbos en el pretérito:

cené
estudié
gasté
tomé
trabajé
visité

Helpscreen with "él/ella" [he/she] verb forms:

La forma "él/ella" de los verbos en el pretérito:

cenó
estudió
gastó
tomó
trabajó
visitó

HELP MENU [Available only to Group 4]

1. Explain the vocabulary
   [If this is selected, the vocabulary screen for the day appears.]

2. Explain the question
   [If this is selected, helpscreen which gives English translation appears.]

3. Show me the "yo" verb forms
[If this is selected, the helpscreen which shows all the "yo" (I) forms of the day's verbs appears.]

4. Show me the "él/ella" verb forms
[If this is selected, the helpscreen which shows all the "él/ella" (he/she) forms of the day's verbs appears.]

Day 9

Hypothesis: Choosing passage from menu vs. no choice of passage

New item: Regular preterite of -AR verbs (plural forms; reflexive (for recognition only)

Review: Regular preterite of -AR verbs (singular forms)

New vocab:

Story 1	Story 2	Story 3	Story 4
concierto	cueva	cita	piscina
incluso	canción	incluso	toallas
escenario		torre	canción
canción		canción	

----- Old -AR verbs common to all 4 stories: -----

bajar	llegar	pasar
cantar	mirar	sentarse
tocar	tomar	

Teaching strategy:

Experimental group: From a list of four story titles, students choose the one they wish to read. This choice will determine not only the passage itself, but the particular version of the rest of the lesson they will see, since other activities are based on sentences from the passages. However, the stories and activities are parallel for both broups.

Control group: Students read the passage assigned.

Both groups: Students are given a tutorial lesson, using sentences from the assigned reading, on the plural forms of the preterite. They then read through the passage itself, following which they are asked a series of true-false comprehension questions about the reading.

Example: Experimental Group

"In this exercise you will read a story in the past tense and then answer questions about it.

First, you get to choose the story. Read through the following titles, then select by typing the number of the one you want to read.

1 Un concierto de "rock" [A rock concert]

2 Cuatro "yanquis" en Madrid [Four yankees in Madrid]

3 Mi primera cita [My first date]

4 Una semana en Hawaii" [A week in Hawaii]

[After student selects story number, the vocabulary screen, and questions given to that student will relate specifically to that story.]

Example: Control Group

[Automatically gets the second reading, "Cuatro yanquis en Madrid."]

Day 10

Hypothesis: Answer-judging hypothesis 4: implicit vs. explicit correction

New Item: Reflexive with NOS; preterite reflexives (new combination)

New vocab:

ayer	campada	conversar
ducharse	fue	de prisa
tan		

Teaching strategy:

Both groups: This exercise consists of a version of the game known as "Mad Lib". In this game, certain words are elicited from the students out of context, then are later inserted by the program into a "story". The result is a silly, often humorous, reading. All students contributed vocabulary as prompted by the computer, then were given tutorials focusing on the forms of the relexive with NOS and the use of the reflexive in the preterite. Finally, students completed a cloze exercise in which the passage was reconstructed by filling in blanks for missing words. Feedback on this final exercise was given in two different forms, one explicit, the other implicit:

Example: Mad Lib

"Pretend you are in summer camp and you're writing a letter to your parents. In fact, the computer will write it for you -- all

you have to do is give it a few words.

For each number below, type in one word (en espanol, claro!) according to the directions given.

1. plural noun
2. number (spelled out) from 2 to 5
3. something to drink
4. something to eat
5. a room in a house
6. articles of clothing (plural)
7. a sport

[Reading passage -- the letter -- computer automatically inserted the word selected above by the student for each space with a number below]

Queridos mama y papa,

Ayer mis hermanos y yo pasamos el primer día en la campada. Es un lugar muy interesante, con muchos/as {1}.

Esta mañana mis hermanos se levantaron tarde, pero yo me levanté a las {2}. El director preguntó, "Juan, ?por qué te levantaste tan temprano? ?Te acostaste muy temprano anoche? "Sí," contesté de prisa.

Luego nos duchamos con {3}, y nos limpiamos los dientes con {4}. Mi amigo Carlos se peinó con {6}, y comenzamos a jugar al {7} en el {5}.

Group 1: Explicit
On the first mistrial, the student's error is highlighted on the screen, followed by, "No es correcto. Intenta otra vez." (Not correct, try again.) On the second mistrial, the correct answer is explicitly modelled and the student tries again, such as:
Program: What did he do?
Student: He waked up.
Program. No, HE WOKE UP. Try again.
On the third mistrial, the correct answer is given again.

Group 2: Implicit
On the first and second mistrials, the student's error is highlighted on the screen, and a question appears which implicitly models the correct form in a communicative manner, such as:
Program: What did he do?
Student: He waked up.
Program: Who did you say woke up?
Student: (new response)
On the third mistrial, the correct answer is given.

APPENDIX C: SAMPLE ACHIEVEMENT TESTS

ACTIVITY DAY 9, TEST 1

Part I. Comprehension/production (mixed)

Complete each sentence in Spanish
with the CORRECT FORM of one of the
verbs beneath the sentence.

---

1. Nosotros _____ una semana en México
el año pasado.

tocar pasar llegar

[1. We _____ a week in Mexico last year.
to play (an instrument) to spend to arrive]

Escribe el verbo aquí:

(if (pasamos) then) Muy bien.
(Otherwise) Lo siento.

---

2. Ayer los chicos _____ canciones bonitas.

mirar tomar cantar

[2. Yesterday the children _____ beautiful songs.]

to look at to take to sing]

Escribe el verbo aquí:

(if (cantaron) then) Muy bien.

(otherwise) Lo siento.

---

3. Mis amigos _____ a la escuela en el autobús esta mañana.

llegar tomar tocar

[3. My friends _____ at school in the bus this morning.

to arrive to take to play (an instrument)]

Escribe el verbo aquí:

(if (llegaron) then) Muy bien.

(otherwise) Lo siento.

---

4. Nosotros _____ del autobús al final del viaje.

llegar bajar mirar

[4. We _____ the bus at the end of the trip.

to arrive to get off to look at]

Escribe el verbo aquí:

(if {bajamos} then) Muy bien.
(otherwise) Lo siento.

---

5. Nosotros _____ muchas canciones en la fiesta el sábado pasado.

tomar mirar cantar

[5. We _____ many songs at the party last Saturday.
to take to look at to sing]

Escribe el verbo aquí:

(if {cantamos} then) Muy bien.
(otherwise) Lo siento.

---

6. Muchas personas _____ guitarras en la fiesta mexicana.

tomar tocar cantar

[6. Many people _____ guitars at the Mexican party.
to take to play to sing]

Escribe el verbo aquí:

(if (tocaron) then) Muy bien.

(otherwise) Lo siento.

DAY 9, TEST 2: Discrete/recognition

Match each sentence with the LETTER of the word which best fits the blank.

---

1. Podemos nadar en la...

a. cita b. piscina c. cueva

[1. We can swim in the

a. date b. pool c. cave]

Escribe la letra aquí:

(if (b) then) Muy bien.

(otherwise) Lo siento.

---

2. Los dos jóvenes tienen una ... para ir al cine.

a. cueva b. canción c. cita

[2. The two young people have a ____ for the movie.

a. cave b. song d. date]

Escribe la letra aquí:

(if (c) then) Muy bien.

(otherwise) Lo siento.

---

3. Los chicos ... un refresco en el café.

a. tomamos b. tocaron c. tomaron

[3. The boys ___a soft drink in the cafe.

a. (we) drank b. (they) played c. (they) drank]

Escribe la letra aquí:

(if (c) then) Muy bien.

(otherwise) Lo siento.

---

4. ?Puedes cantar una ... para nosotros?

a. canción b. cantante c. nación

[4. Can you sing a _____ for us?

a. song b. singer c. nation]

Escribe la letra aquí:

(if (a) then) Muy bien.

(otherwise) Lo siento.

---

5. Todos nosotros ... la televisión ayer.

a. miraron b. empezaron c. miramos

[5. We all _____ television yesterday.

a. (they) watched b. (they) began c. (we) watched

Escribe la letra aquí:

(if (c) then) Muy bien.

(otherwise) Lo siento.

B. DAY 10, TEST 2

Part I: Integrative/recognition

In the following exercise, choose the version of each sentence which seems most likely.

Toca RETURN

---

1. Ayer por la mañana...
   (a) ...nos levantamos a las tres.
   (b) ...nos levantamos a las seis.
   (c) ...nos levantamos a las doce.

[1. Yesterday morning...
   (a) ...we got up at 3.
   (b) ...we got up at 6.
   (c) ...we got up at 12.]

Escribe una letra (a-c):

(if (b) then) Sí, es lógico.
(otherwise) ?Cómo? Otra vez.

---

2. (a) Me duché con agua.
   (b) Me duché con Coca-Cola.

(c) Me duché con leche.

[2. (a) I showered with water.

(b) I showered with Coca-Cola.

(c) I showered with milk.]

Escribe la letra (a-c):

(if (a) then) Sí, es lógico.

(otherwise) ?Cómo? Otra vez.

---

3. Ayer nos quitamos la ropa...

(a) ...después de tomar un baño.

(b) ...antes de tomar un baño.

(c) ...antes de cenar.

[3. Yesterday we took off our clothes...

(a) ...after taking a bath.

(b) ...before taking a bath.

(c) ...before eating dinner.]

Escribe una letra (a-c):

(if (b) then) Sí, es lógico.

(otherwise) ?Cómo? Otra vez.

---

4. Ayer por la mañana mis hermanos...

(a) ...se quitaron los dientes.

(b) ...se afeitaron los dientes.

(c) ...se limpiaron los dientes.

[4. Yesterday morning my brothers...

(a) ... took off their teeth.

(b) ... shaved their teeth.

(c) ... cleaned their teeth.]

Escribe una letra (a-c):

(if (c) then) Sí, es lógico.

(otherwise) ?Cómo? Otra vez.

---

5. (a) Mi amigo se peinó el pelo.

(b) Mi amigo se quitó el pelo.

(c) Mi amigo se acostó el pelo.

[5. (a) My friend combed his hair.

(b) My friend took off his hair.

(c) My friend put his hair to bed.]

Escribe una letra (a-c):

(if (a) then) Sí, es lógico.

(otherwise) ?Cómo? Otra vez.

---

6. Esta mañana el director preguntó...

(a) ?A qué hora te levantaste anoche?

(b) ?A qué hora te acostaste anoche?

(c) ?A qué hora te despertaste anoche?

[6. This morning the director asked...

(a) What time did you get up last night?

(b) What time did you go to bed last night?

(c) What time did you wake up last night?]

Escribe una letra (a-c):

(if (b) then) Sí, es lógico.

(otherwise) ?Cómo? Otra vez.

DAY 10, TEST 2: Discrete/production

Complete each sentence with the CORRECT FORM of one of the verbs beneath the sentence.

---

1. Esta manana yo _____ muy temprano.

acostar(se) despertar(se) quitar(se)

[1. This morning I _____ very early

to go to bed to wake up to take off]

Escribe la respuesta aquí:

(if {me desperté} then) Muy bien.

(otherwise) ?Cómo?

---

2. Ayer los chicos no _____ los dientes.

limpiar(se) quitar(se) acostar(se)

[2. Yesterday the boys didn't _____ their teeth

to clean to take off to go to bed]

Escribe la respuesta aquí:

(if {se limpiaron} then) Muy bien.

(otherwise) ?Cómo?

---

3. Nosotros _____ con agua caliente ayer.

despertar(se) quitar(se) bañar(se)

[3. We _____ with hot water yesterday.
to wake up to take off to bathe]

Escribe la respuesta aquí:

(if {nos bañamos} then) Muy bien.
(otherwise) ?Cómo?

---

4. El director _____ muy temprano esta mañana.

limpiar(se) levantar(se) quitar(se)

[4. The director _____ very early this morning.
to clean (oneself) to get up to take off]

Escribe la respuesta aquí:

(if {se levantó} then) Muy bien.
(otherwise) ?Cómo?

---

5. Nosotros _____ muy tarde ayer por la

noche despues de la fiesta.

levantar(se) despertar(se) acostar(se)

[5. We _____ very late last night after the party.
to get up to wake up to go to bed]

Escribe la respuesta aquí:

(if {nos acostamos} then) Muy bien.
(otherwise) ?Cómo?

---

6. Jaime _____ la ropa para bañarse.

afeitar(se) quitar(se) duchar(se)

[6. Jim _____ his clothes to take a bath.
to shave to take off to shower]

Escribe la respuesta aquí:

(if {se quitó} then) Muy bien.
(otherwise) ?Cómo?

POST TEST

PLEASE PRINT:
YOUR NAME: _____
(last) (first)

TEST TYPE: Discrete/recognition

I. Mark an X through the NUMBER of the items below which would normally be found in a bathroom. (For example, if you choose #17 & 18: ~~17~~ ~~18~~.)

1. peine	7. jamón	13. espejo
2. gafas de sol	8. champú	14. árbol
3. afeitadora	9. elefante	15. canción
4. jabón	10. champán	16. cepillo
5. piscina	11. toalla	17. pelota
6. sopa	12. agua	18. prisa

TEST TYPE: Integrated recognition

II. Mark an X through the LETTER of the sentence that best ANSWERS each question.

1. ¿Te levantas a las 6?

   a. Yes, I get up at 6.
   b. Yes, you sit down at 6.
   c. Yes, I sit down at 6.
   d. Yes, you get up at 6.

2. ¿Se mira Ud. en el espejo?

   a. Yes, he sees himself in the mirror.
   b. Yes, I look in the cabinet.
   c. Yes, he looks in the cabinet.
   d. Yes, I look in the mirror.

3. ¿Te acuestas en el museo?

   a. No, he doesn't sit down in the music room.
   b. No, you don't go to bed in the museum.
   c. No, I don't sit down in the music room.
   d. No, I don't go to bed in the museum.

4. ¿Se duermen los profesores en la clase?

   a. No, the teachers don't dance in class.
   b. No, he and his teacher don't argue in class.
   c. No, the teachers don't fall asleep in class.
   d. No, you and your teacher don't dance in class.

5. ¿Te afeitas en el cuarto de baño?

a. Yes, I wash myself in the bathroom.
b. Yes, you shave in the bathroom.
c. Yes, you wash yourself in the bathroom.
d. Yes, I shave in the bathroom.

6. ¿Comen Uds. en el comedor?

a. Yes, we eat in the kitchen.
b. Yes, you eat in the kitchen.
c. Yes, we eat in the dining room.
d. Yes, you eat in the kitchen.

8. ¿Se limpian Uds. el pelo con champú?

a. No, we don't wash our dog with shampoo.
b. Yes, you wash your hair with champagne.
c. Yes, you wash your dog with shampoo.
d. Yes, we wash our hair with shampoo.

TEST TYPE: Discrete recognition

III. AT THE RIGHT OF THE LISTS, Mark an X through the LETTER of the English word that matches each Spanish word. USE ONLY THE RIGHT-HAND COLUMN for each answer. For example, if 1."vanidoso" matches b."angry", your answer would be:

1. a X c d e f g

1. vanidoso	a. happy	1. a b c d e f g
2. suéter	b. angry	2. a b c d e f g
3. rápidamente	c. vain	3. a b c d e f g
4. feliz	d. sweater	4. a b c d e f g
5. barba	e. quickly	5. a b c d e f g
	f. swear	
	g. beard	

---

6. medianoche	a. student	6. a b c d e f g
7. carro	b. midnight	7. a b c d e f g
8. árbol	c. carrot	8. a b c d e f g
9. estudiante	d. noon	9. a b c d e f g
10. chiste	e. tree	10. a b c d e f g
	f. car	
	g. joke	

---

11. cuchillo	a. face	11. a b c d e f g
12. canción	b. friend	12. a b c d e f g
13. cara	c. knife	13. a b c d e f g
14. pijama	d. sleepwear	14. a b c d e f g
15. amigo	e. page	15. a b c d e f g
	f. car	
	g. song	

TEST TYPE: Discrete recognition

IV. Mark an X through the letter of the sentence which best ANSWERS each question.

1. ¿Su papá se afeita por la mañana?

   a. Sí, te afeitas por la mañana.
   b. Sí, lo afeito por la mañana.
   c. Sí, se afeita por la mañana.

2. ¿Te sientas en el autobús público?

   a. No, no me siento en el autobús público.
   b. No, no te sientas en el autobús público.
   c. No, no me sientas en el autobús público.

3. ¿Se divierten Uds. el sábado?

   a. Sí, se divierte el sábado.
   b. Sí, nos divertimos el sábado.
   c. Sí, nos divierten el sábado.

4. ¿Se peinan las chicas por la mañana?

   a. Sí, se peinan.
   b. Sí, las peino.
   c. Sí, me peinan.

5. ¿Te despiertas muy temprano?

   a. Sí, te despiertas muy temprano.
   b. Sí, te despierto muy temprano.
   c. Sí, me despierto muy temprano.

6. ¿Cómo se llama su actor favorito?

   a. Se llama Harrison Ford.
   b. Me llamo Harrison Ford.
   c. Se llamas Harrison Ford.

V. Mark an X through the LETTER of the sentence which MAKES THE MOST SENSE.

TEST TYPE: Integrated recognition

1.

   a. Me acuesto cuando te afeitas.
   b. Te lavas cuando te levantas.
   c. Me limpio con champú cuando me levanto.

2.

   a. Te sientas en la sopa cuando te acuestas.
   b. Te pones el pijama cuando te acuestas.
   c. Te pones los dientes cuando te acuestas.

3.

a. Los muchachos van al comedor en el autobús público.
b. Los muchachos van a la escuela en el autobús público.
c. Los muchachos van al abrigo en el autobús público.

4.

a. En la escuela, los estudiantes se llaman.
b. En la escuela, los estudiantes estudian.
c. En la escuela, los estudiantes se levantan.

5.

a. Por la noche, los chicos se ponen los dientes.
b. Por la noche, los chicos se cepillan los dientes.
c. Por la noche, los chicos se quitan los dientes.

6.

a. Por la noche, Roberto y Luis se levantan.
b. Por la noche, Roberto y Luis toman el desayuno.
c. Por la mañana, Roberto y Luis se levantan.

7.

a. Las chicas se llaman María y Carmen.
b. Las chicas se llaman la escuela.
c. Las chicas se bañan María y Carmen.

8.

a. Probablemente me baño con jabón.
b. Probablemente me baño con sopa.
c. Probablemente me baño con jamón.

9.

a. Te afeitas el pelo con champú.
b. Te limpias con champú.
c. Te lavas el pelo con champú.

10.

a. Me limpio los dientes cuando me levanto.
b. Te limpias los dientes cuando me siento.
c. Me limpio los dientes cuando me pongo el abrigo.

TEST TYPE: Discrete production

VI. Write in Spanish the opposite of the word or phrase below.

1. dormirse _____
2. encima de _____
3. detrás de _____
4. acostarse _____
5. agua fría _____
6. ponerse _____

TEST TYPE: Discrete & integrated production

VII. Complete each sentence with the correct form of one of the verbs beneath the sentence.

1. Yo_____ una semana en México el año pasado.
   tocar pasar llegar
2. Ayer mi amigo _____unas canciones bonitas.
   mirar tomar cantar
3. Tú_____a la escuela en el autobús ayer.
   llegar tomar tocar
4. Susana _____del autobús al final del viaje.
   llegar bajar mirar
5. Yo_____Coca-Cola ayer en la fiesta.
   tomar mirar cantar
6. Tú _____la guitarra ayer en la fiesta.
   tomar tocar cantar

TEST TYPE: Integrated production

VIII. For each blank in the following story, write the appropriate verb in the space provided at the end. This is a story about two friends who do everything the opposite! (Do you know anyone like that?)

PEPE EL LOCO

Yo siempre me despierto a las seis de la mañana. Mi amigo, Pepe, _____(1)_____ a las nueve. Pepe siempre dice, "Tú, Manuel, eres muy loco." Y yo contesto, "Pepe, tú eres muy loco. ¡Yo me despierto muy temprano, pero tú _____(2)____ muy tarde!"

Yo digo, "Pepe, tú eres muy loco. Te duermes en el sofá. Yo ____(3)_____ en la cama."

De verdad mi amigo Pepe es muy loco. Yo me pongo los zapatos para ir a la escuela. Pepe no _____(4)_____ los ____(5)_____. Yo digo, "Pepe, eres muy loco. ¿Por qué tú _____(6)_____ los zapatos para ir a la escuela?

Tambien yo me divierto el sábado, pero Pepe nunca _____(7)_____. Trabaja siempre. ¡Pepe es mi buen amigo, pero es MUY loco!

ANSWERS:

1._____ _____ 5._____ _____

2._____ _____ 6._____ _____

3._____ _____ 7._____ _____

4._____ _____

TEST TYPE: Discrete production

IX. Anwer the following questions. (They are NOT about the above story.)

1. Estudiaste ayer?

---

2. Trabajaron ustedes el domingo?

---

3. Cenó José con tu familia ayer?

---

4. Desayunó usted mucho hoy?

---

5. ¿Conversaron ustedes con el Presidente Reagan ayer?

---

6. ¿Tomaron champán los niños ayer?

X. Read the following paragraph.
TEST TYPE: Discrete recognition

Estamos en la casa de un mexicano. La persona se llama Pedro López. Pedro trabaja mucho por la noche. Por eso, se levanta muy tarde. Pedro se levanta a las once de la mañana. Va al cuarto de baño. Pedro es muy vanidoso también. Por eso, se mira en el espejo mucho. El tiene barba. Se afeita con una afeitadora eléctrica.

Now, answer the following questions about the paragraph. Use COMPLETE SENTENCES.

1. ¿Dónde estamos?

---

2. ¿A qué hora se levanta?

---

3. ¿Qué tiene él?

---

4. ¿Qué hace con una afeitadora eléctrica?

Mark an X through the LETTER of the word or phrase which best completes the sentences about the story.

5. Pedro López gets up ...
   a. early
   b. late

6. Pedro López works ...
   a. a little
   b. a lot

7. Pedro gets up at...

   a. eleven o'clock
   b. one o'clock
   c. six o'clock

8. Pedro looks at himself a lot in the mirror because...

   a. he is happy
   b. he is worried about pimples
   c. he is vain

TEST TYPE: Integrated recognition

XI. Mark an X through the LETTER of the sentence which makes the most sense.

1. Ayer...
   a. nos levantamos a las tres.
   b. nos levantamos a las seis.
   c. nos levantamos a las doce.

2 a. Me duché con agua.
   b. Me duché con Coca-Cola.
   c. Me duché con el impermeable.

3. Nos limpiamos los dientes...
   a. con champú.
   b. con jabón.
   c. con crema dental.

4. Anoche Jaime...
   a. gastó mucho dinero.
   b. gasta mucha comida.
   c. gastó mucha comida.

5. Anoche mis amigos...
   a. miraron la televisión.
   b. miran la televisión.
   c. gastaron la televisión.

6. Ayer por la noche, tú...
   a. llamas a tu mamá.
   b. llamaste a tu mamá.
   c. quitas a tu mamá

XII. Mark an X through the LETTER of the best TRANSLATION for each English phrase below.

1. I studied.
   a. estudias
   b. estudié
   c. estudiaste

2. We worked.
   a. trabajamos
   b. trabajaron
   c. trabajó

4. We combed our hair
   a. nos peinamos
   b. nos peinó
   c. nos peinan

5. Juanita sat down.
   a. se sentaron
   b. se sienta
   c. se sentó

6. We washed ourselves
   a. nos lavan
   b. nos lavamos
   c. nos lavaron

APPENDIX E

Description of the Pimsleur Language Aptitude Battery *

The Pimsleur Language Aptitude Battery (PLAB), developed for use in Grades 7-12, containes five subtests to assess different aspects of language aptitude. These subtests and a description of the specific ability (ies) each is designed to test are as follows (Pimsleur, 1966).

1. Interest in learning a foreign language: designed to give an indication of a student's motivation.
2. Vocabulary: word knowledge in English; designed, along with the next section on language analysis , to provide information regarding a student's verbal ability and his ability to handle the mechanics of a foreign language.
3. Language analysis: ability to reason logically in terms of a foreign language.
4. Sound discrimination: ability to learn new phonetic distinctions and to recognize them in different contexts; designed to test the student's ability to hear and retain new sounds.
5. Sound-symbol association: an association of sounds with their written symbols; designed to measure a student's ability to associate English-lanuage sounds with their written symbols.

* Extracted from Robinson, 1981
In the present study only subtests 2-5 were used.

IBM 805 ANSWER SHEET

PIMSLEUR LANGUAGE APTITUDE BATTERY

FORM S
SIDE 1

Please Print

NAME: _____ (LAST, FIRST) Teacher _____

PART 1 GRADES IN MAJOR SUBJECTS

English Grade	Soc. St.-Hist. Grade	Arith.-Math. Grade	Science Grade
E/F—Space 1	E/F—Space 1	E/F—Space 1	E/F—Space 1
D—Spaces 1, 2	D—Spaces 1, 2	D—Spaces 1, 2	D—Spaces 1, 2
C—Spaces 1, 2, 3	C—Spaces 1, 2, 3	C—Spaces 1, 2, 3	C—Spaces 1, 2, 3
B—Spaces 1, 2, 3, 4	B—Spaces 1, 2, 3, 4	B—Spaces 1, 2, 3, 4	B—Spaces 1, 2, 3, 4
A—Spaces 1, 2, 3, 4, 5	A—Spaces 1, 2, 3, 4, 5	A—Spaces 1, 2, 3, 4, 5	A—Spaces 1, 2, 3, 4, 5

PART 2 INTEREST

We would like you to give an estimate of how interested you are in studying a modern foreign language. In making this estimate, ask yourself how useful a foreign language will be to you, how much you will enjoy it, and how interested you are in foreign languages as compared with other subjects.

Take time to think over your answer; then indicate your interest in studying a modern foreign language.

Rather uninterested	—Space 1
More or less indifferent	—Spaces 1, 2
Mildly interested	—Spaces 1, 2, 3
Rather interested	—Spaces 1, 2, 3, 4
Strongly interested	—Spaces 1, 2, 3, 4, 5

PART 3 VOCABULARY

SAMPLE a b c d

	a	b	c	d
1				
2	e	f	g	h
3	a	b	c	d
4	e	f	g	h
5	a	b	c	d
6	e	f	g	h
7	a	b	c	d
8	e	f	g	h
9	a	b	c	d
10	e	f	g	h
11	a	b	c	d
12	e	f	g	h
13	a	b	c	d
14	e	f	g	h
15	a	b	c	d
16	e	f	g	h
17	a	b	c	d
18	e	f	g	h
19	a	b	c	d
20	e	f	g	h
21	a	b	c	d
22	e	f	g	h
23	a	b	c	d
24	e	f	g	h

PART 4 LANGUAGE ANALYSIS

	a	b	c	d
1				
2	e	f	g	h
3	a	b	c	d
4	e	f	g	h
5	a	b	c	d
6	e	f	g	h
7	a	b	c	d
8	e	f	g	h
9	a	b	c	d
10	e	f	g	h
11	a	b	c	d
12	e	f	g	h
13	a	b	c	d
14	e	f	g	h
15	a	b	c	d

PART 5 SOUND DISCRIMINATION

1	cabin	boa	16	cabin	boa	friend
2	cabin	boa	17	cabin	boa	friend
3	cabin	boa	18	cabin	boa	friend
4	cabin	boa	19	cabin	boa	friend
5	cabin	boa	20	cabin	boa	friend
6	cabin	boa	21	cabin	boa	friend
7	cabin	boa	22	cabin	boa	friend
8	boa	friend	23	cabin	boa	friend
9	boa	friend	24	cabin	boa	friend
10	boa	friend	25	cabin	boa	friend
11	boa	friend	26	cabin	boa	friend
12	boa	friend	27	cabin	boa	friend
13	boa	friend	28	cabin	boa	friend
14	boa	friend	29	cabin	boa	friend
15	boa	friend	30	cabin	boa	friend

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TURN TO SIDE 2 FOR PART 6 ▶

LANGUAGE APTITUDE BATTERY

PART 6 SOUND-SYMBOL ASSOCIATION

SAMPLE	1	2	3	4
tranledil	snosfen	thurksle	tiksgel	nimbril
tarpled	sonsfen	thruksle	tigskel	minbirl
tarpdel	snosnef	thruskle	tiskgel	nimbirl
trapdel	sonsnef	thurskle	tigksel	minbril
5	**6**	**7**	**8**	**9**
thorleg	rosktrag	afrap	culther	wotner
throgle	rostkrag	arfap	cluther	wontner
thorgle	rokstrag	afpar	cuthler	wonter
throleg	rotskrag	arpaf	cluthler	wentnor
10	**11**	**12**	**13**	**14**
rielig	tronbleg	clasket	widnt	nasperdop
rigiel	tombleg	calsket	windt	napserdop
riegiel	trolbneg	claksct	witnd	napseprod
rielieg	torlbneg	calkset	wintd	naspeprod
15	**16**	**17**	**18**	**19**
mazordli	cheblogez	filsanter	krimsloder	nasfoshun
marzodli	cheboglez	fislanter	krilsmoder	nafsoshun
madorzli	chelbogez	fislatner	klimsroder	nashfosun
marodzli	chelgobez	filslatner	klidsmoder	nafshosun
20	**21**	**22**	**23**	**24**
birilum	kriblultos	saferkal	trazbimen	tolandus
bririlum	krilbultos	sakerfal	trambizen	todandlus
birilnum	kirblultos	safekral	tranbimez	toldandus
bririlnum	kirlbultos	sakrefal	trazbinem	tolandlus

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APPENDIX F:

Student Interest Questionnaire:
Frequency and Percentage

1. What time do you normally get up on a school day ?

	FREQUENCY (N)	PERCENTAGE %
6:30-7:00	32	50 %
7:00-8:00	15	23 %
6:00-6:30	10	16 %
5:30-6:00	6	9 %
5:00-5:30	1	2 %
	(64)	

2. What is your favorite toothpaste ?

Crest	30	38 %
Colgate	16	21 %
Aqua Fresh	15	19 %
Aim	14	18 %
Close-Up	2	3 %
Topal	1	1 %
	(78)	

3. Your favorite soft drink ?

Coke	24	32 %
7 Up	14	18 %
Pepsi	13	17 %
Sprite	6	8 %
Root Beer	4	5 %
Cream Soda	3	4 %
(12) 2< other	12	16 %
	(76)	

4. What does the typical Montera student (boy or girl, whichever applies to you) wear to school ?

Jeans	28	25 %
Regular Shirt	15	14 %
Sweater	13	12 %
Clothes	9	8 %
Shoes	8	7 %
Jacket	5	5 %
Trendy Clothes	5	5 %
Pants	5	5 %
(11) 3< other	22	20 %
	(110)	

5. What do you wear when it rains ?

	FREQUENCY (N)	PERCENTAGE %
Warm Jacket	22	19 %
Normal Clothes	21	18 %
Sweater	12	10 %
Jeans	12	10 %
Rain Jacket	6	5 %
Big Coat	5	4 %
Shirt	5	4 %
Coat	5	4 %
Boots	4	3 %
Shoes	4	3 %
Umbrella	4	3 %
(12) 3< other	15	13 %
	(115)	

6. Name two school subjects you are taking now.

Spanish	32	22 %
English	22	15 %
Math	20	14 %
Civics/Economics	11	7 %
Algebra	9	6 %
Geometry	7	5 %
Public Speaking	6	4 %
Science	4	3 %
Gym	4	3 %
(19) 3< other	33	22 %
	(148)	

7. Your most difficult class ?

Algebra	17	24 %
Math	16	22 %
Spanish	8	11 %
Civics/Economics	6	8 %
History	5	7 %
English	5	7 %
(8) 2< other	15	21 %
	(72)	

8. Your most interesting class ?

	FREQUENCY (N)	PERCENTAGE %
Civics/Economics	9	12 %
English	7	10 %
Biology	6	8 %
Typing	6	8 %
Math	5	7 %
Spanish	4	5 %
Science	4	5 %
Algebra	4	5 %
(17) 3< other	28	38 %
	(73)	

9. Name two electric appliances you think a typical American family might have in its kitchen ?

Toaster	37	25 %
Microwave	26	18 %
Stove/Oven	23	16 %
Refrigerator	19	13 %
Blender	12	8 %
Food Processor	6	4 %
Coffee Maker	6	4 %
Mixer	5	3 %
Dishwasher	4	3 %
Electric Can Opener	3	2 %
(5) 2< other	7	5 %
	(148)	

10 a. Name your favorite sports.....to play :

Football	18	21 %
Basketball	17	20 %
Baseball	12	14 %
Swimming	7	8 %
Soccar	6	7 %
Tennis	5	6 %
Vollyball	3	4 %
Gymnastics	3	4 %
(11) 2< other	14	16 %
	(85)	

10 b. Name your favorite sports.....to watch:

	FREQUENCY (N)	PERCENTAGE %
Football	39	47 %
Baseball	13	16 %
Basketball	7	8 %
Gymnastics	6	7 %
Swimming	4	5 %
Soccar	3	4 %
Boxing	3	4 %
(7) 2< other	8	10 %
	(83)	

11. What do you do on a Saturday afternoon ?

With Friends	14	15 %
Movies	10	10 %
Shopping	9	9 %
Go out	9	9 %
Watch TV	8	8 %
Sleep	7	7 %
Homework	7	7 %
Play Sports	5	5 %
Work	4	4 %
(20) 2< other	23	24 %
	(116)	

12. If you could go anywhere, where would you most like to visit ?

Europe	23	27 %
Hawaii	16	19 %
Australia	10	12 %
Carribean	7	8 %
Mexico	3	3 %
South America	3	3 %
(22) 2< other	24	28 %
	(86)	

13 a. Who is your favorite male actor/singer ?

		FREQUENCY (N)	PERCENTAGE %
MALE ACTOR	Eddy Murphy	13	31 %
	Harrison Ford	3	7 %
	Mel Gibson	3	7 %
	(19) 2< other	23	55 %
		(42)	
MALE SINGER	Prince	21	46 %
	Morris Day	3	7 %
	Huey Lewis	3	7 %
	(15) 2< other	19	41 %
		(46)	

13 b. Favorite female actress/singer ?

FEMALE ACTRESS	Marylin Manroe	5	16 %
	Joan Collins	4	13 %
	Meryl Streep	3	9 %
	Karen Allen	3	9 %
	(15) 2< other	17	53 %
		(32)	
FEMALE SINGER	Madonna	13	29 %
	Shiela E	9	20 %
	Apalonia Kortero	5	11 %
	Roxanne	4	9 %
	Cyndy Lauper	4	9 %
	(9) 2< other	10	22 %
		(45)	

14. Which kind of stories interest you most (detective, science fiction, romance, other...) ?

Romance	23	25 %
Science-Fiction	16	18 %
Mystery/Murder/Horror	16	18 %
Detective	10	11 %
Fiction	9	10 %
Action/Adventure	6	6 %
Novels	2	2 %
(9) one per, other....	9	10 %
	(91)	

15. What kind of problem-solving activities would you be most interested in solving (crosswords, riddles, mysteries, other) ?

	FREQUENCY (N)	PERCENTAGE %
Mysteries	37	44 %
Crosswords	20	24 %
Riddles	19	23 %
Finding Words	2	2 %
(6) one per, other...	6	7 %
	(85)	

16. Which of the following topics would you probably be most interested in reading about ?

A first date	22	31 %
A week in Acapulco...	9	13 %
The superbowl	8	11 %
A trip in the space shuttle	6	8 %
A wierd dream	6	8 %
A neighborhood crime.	4	6 %
(13) 3< other	17	24 %
	(72)	

17. What aspects of Spanish culture do you like best ?

Food	31	34 %
Dances(ing)	10	11 %
Way they talk	4	4 %
Lifestyle	4	4 %
Nothing	4	4 %
Drinking age	4	4 %
Language	3	3 %
Clothing (dress)	3	3 %
(23) 2<, other	29	32 %
	(92)	

APPENDIX G

TRANSCRIPT OF VIDEOTAPED INTERVIEWS*

I. Interviews with individual students while working in the computer laboratory (13 students)

[Dr. Robinson talking with S1]

S1 - I talked with my parents, and I told them that I really liked this class a lot and I was learning a whole bunch, and I was starting to understand it, and so I told them, "Well, we're going to Hawaii, and how much is our air fare?" and they said, "About fifteen hundred dollars," so I said "Well, do you want to spend it on a computer instead?"

Dr. R - You asked them that?

S1 - I asked them, ...

Dr. R - You prefer the computer to a trip to Hawaii?

S1 - Well, I've already been there once. I mean, if I used the computer, I'd be learning Spanish, and could get much better grades in my English and math classes, and I really like them [computers]. So they said, "Well, we'll get you one anyway. We can pay the bill, and still go to Hawaii, so...

Dr. R - Fabuloso.

S1 - So, I'm going to get [a computer]!

Dr. R to Student 2 - How do you feel about this class, compared to your regular class?

S2 - It's better... it's more interesting.

Dr. R - What else do you like about it, or dislike about it. What are your other opinions?

S2 - It's fun. It's not as boring as regular class.

Dr. R - In your other classes, do you concentrate this much?

S2 - I suppose it depends, what you're doing...ummmm ....no, I guess not, 'cause your attention isn't focused on just one thing.

Dr. R - That's interesting.

Dr. R to Student3 - What did you think of the lesson?

* Group comments, <u>not</u> distinguished by experimental versus control groups.

S3 - It was fun.

Dr. R - Fun? What did you like about it?

S3 - Everything, I guess.

Dr. R - How does this compare to your classroom instruction?

S3 - Well, it's not as boring.

Dr. R - Good.... [to Student 4] Well, you're used to working in a classroom, and now you're working on a computer, how do you like this?

S4 - It's fine...

Dr. R - What do you think... is this like a game, or is it different?

S4 - No, it's good for learning....

Dr. R - Are you learning from this?

S4 - Yeah, I guess. We've never had any of this kind of stuff..

Dr. R - How do you think you're doing on the tests?

S4 - Doing okay.

Dr. R - Are you getting them correct?

S4 - Yeah.

Dr. R - Well, great...How does this compare to your classroom experience?

S4 - (Laughter) This ends quicker, so....

Dr. R - But you are learning?

S4 - Yeah, that's true. It 's a good idea, I guess.

Dr. R to Student 5 - How do you think this compares to your regular classroom -- is it easier or more difficult to learn?

S5 - It's easier to learn, but it's easy anyway.

Dr. R - So it seems easy to you in the classroom too? So Spanish is just easy for you.How have you enjoyed this, working on the computer, as compared to your regular classroom?

S5 - Well, sometimes it's fun and sometimes it's not. Because

with this you can't go back and correct what you did wrong.

Dr. R - You can't?

S5 - Well, most of them, you can't.

Dr. R - Do you try pressing this button? Before you press the Return button, you can go back and correct it.

S5 - No, but sometimes you have absolutely no idea, and you have to choose a letter....

Dr. R Ohh....(to S6) What did you like about it?

S6 -It's more challenging.

Dr. R - More challenging! How does this compare to your classroom--how do you enjoy it?

S6 -No teacher to tell you to stop doing things.

Dr. R - Like what things?

S6 - Like talking or chewing gum in class....

Dr. R - Does that affect your learning better, do you think?

S6 - I'm not sure.

Dr. R - Do you feel you concentrate well?

S6 - It lets you go your own speed, so you don't have to wait for other kids to read in the book and stuff like that....

Dr. R - You mean other people in the class? Well, that's terrific.

Dr. R to Student 7 - How did you do?

S7 - Well, I messed up twice, but the pictures helped me, when I didn't know the words.

Dr. R - That's good. Do you find that you're learning with this?

S7 - Yeah.

***
Jose to S 8 - How did you like it?

S8 - It was fun.

Jose - What was fun about it?

S8 - I liked the last part, where you put things in order. You decided how to put it. They asked you what order the story came in.

Jose - You thought that was fun?

S8 - Yeah.
Jose - Because it was funny, or...?

S8 - Well, sort of... I understood it -- that was nice!

Jose - You understood the story?

S8 - Uh-huh.

Jose - Was that better than yesterday? Where you had that real short one?

S8 - Yeah....yesterday I had trouble answering the questions. They asked questions, and you had to answer in complete sentences, and I had some problems with it....

Jose - So you did better today?

S8 - Yeah!

Jose to Student 9 - What did you think of it today?

S9 - It was fun.

Jose - What part was fun?

S9 - I didn't have really a favorite part. It was all fun.

Jose - What was the story about?

S9 - Two kids.....

Dr. R to S10 - How did you do today?

S10 - I only missed three.

Dr. R - You only missed three, or got three right?

S10 - I only missed three.

Dr. R - You only missed three! That's fantastico - muy bien! How do you think - are you learning more this way, or less this way, or the same?

S10 - It's more fun than just sitting in class and listening, but the drawback is you can't take it home and study it if you want.

Dr. R - Well, suppose you could -- would you want to?

S10 - Sure.

Dr. R - Do you have a computer at home?

S10 - Uh huh.

Dr. R - Good. Do you have an Apple?

S10 - No, it's a Commodore 64.

Dr. R - Suppose you could get Spanish materials like this to practice at home that went with your classroom things -- would you like that?

S10 - Yeah...

Dr. R - And you'd really do that at home? Would you like doing it better than written homework?

S10 - Yeah.

Dr. R - Okay! That sounds terrific....

Jose to S11 (Boy) -- How did you do?

S11 - Oh, it was pretty good.

Dr.R - Well, did you enjoy it? What did you like about it?

S11 - I don't know....got to pick who I was going to hear about....

Dr. R - Oh, you liked being able to pick -- who did you pick that you'd like to be?

S11 - Forgot.

Dr. R - Well, who would you like to be? If you could be anybody that you wanted to be....

S11 - Well, I don't think that I....

Dr. R - ...How do you like learning this way? Do you feel you're learning?

S11 - Yes.

Dr. R - How does this compare to your regular classroom?

S11 - It's a little easier, 'cause you don't have a teacher to yell at you.

Dr. R (Laughter) What would you do if the computer yelled at you?

S11 - I'd throw it down on the ground.

Dr. R - (Laughter...) Well, the computer's never going to yell at you! ...Does the little "beep" bother you?

S11 - No, I like that!

Dr. R to S12 - .... (In mid-conversation) Why do you think you learn more on the computer?

S12 (girl) - (Unintelligible) ... and it's not organized like a teacher.

Dr. R - Is there anything particular that you like about working with a computer -- like about this lesson today?

S 12 - I don't know -- I guess because you learn new words, and get to put them into the computer and stuff...

Dr. R - Do you think you're actually learning, or is it like playing?

S12 - I'm learning!

Dr. R - How are you doing when it comes to the test part?
S12 - Okay.

Dr. R - Are you getting most of them correct?
S12 - Yeah.

Dr. R - Great. Thanks!
Dr. R to S13 (Boy) - Do you think this is a good way to learn?

S13 - Yeah.
Dr. R - Why?

S 13 - ....Because a lot more attention's paid to you.You're not ignored.

Dr. R - What do you mean "ignored"?

S13 - Well, sometimes in class you can't get to the teacher all the time. This way you can.

Dr. R - What do you mean? What do you "get to" if you don't understand here? What do you do?

S13 - Well, this way you're sitting right in front of the teacher.

Dr. R - I see, so you get to concentrate.....

II. Group discussion in the classroom with another class before computer instruction.

Dr. R (to student group) - How do you feel about learning on the computer?

Student A - Well, it's not any easier, but it's not any harder, than just being in the classroom.

Student B - It's more enjoyable than sitting in the classroom! You get to sit there and just do everything you want instead of doing it as a class.You have your own computer - it's like your own personal little class....

Dr. R - And you like that?

Student B - Yeah.

Student B - It's a lot easier.

Dr. R - Because you're able to concentrate more?

Student B - Uh huh.

(Several students verbally agree....)

Student C - I like being able to work at my own pace. When you have a computer, you can take time to figure things out.

Dr. R - What happens in class? Why can't you go at your own pace?

Student D - Well, you can, but you get lost. You get left behind.
Student E - Well, you are at a disadvantage if you can't type.
(General laughter)

Dr. R - Is working with the computer helping you feel more comfortable with the typing, and with working on a computer in general?

(General assent.)

Student F - Well, if you had computers in all your classes - math, English, it wouldn't be as fun, because the novelty wouldn't be there.

Dr. R - So you think it's fun because it's novel, new?

Student F - Yeah! And it would also get kind of boring to just sit there typing, staring at the screen hour after hour.

Student G - I was going to say, that if we just had computers at school like that, then we could just do the same thing at home!

Dr. R - What if you could do homework at home on the computer, instead of writing things regularly?

S. B (girl) - I'd rather come to class and have a teacher and be able to discuss things, rather than sit there typing onto something that can't really think...a different set of opinions.

Dr. R - So you'd like to have the human element. I think that's real important.

S H - Well, it wouldn't be too good to take homework home and do it on the computer all the time, because suppose you've got to fill out a job application, and you had to hand write it in an office or something, and you would be used to working on a computer, and ....

Dr. R - Good point. Any more comments

S. I - Also, you don't get the specialized comments that you would with a teacher ...it's just a programmed thing....

III. Interview in the Principal's office with Mr. Welsh

Dr. R - Here we are with Mr. Welsh, Principal of Montera Junior High School. ...I think what we would most like to know, is why you've been interested in having this study here?

Welsh - Well, we've been delighted to participate in this study, and there are really three reasons why we were initially interested, and each of these reasons has been reinforced from what I've seen in terms of response students have given in the classroom to the program.

The first is, we have been actively working on introducing the computer into the academic program here at the school, with an emphasis on computer-assisted instruction. This particular program allows the teacher a model of how they can begin to incorporate the microcomputer into the teaching of their particular curriculum. One feature I like about it is that the programs were designed around what is currently being taught in the classroom by the teachers.

The second reason is that we have been promoting foreign languages here for the last five years, and anything in the area that would continue to lend support to that, such as your program, is welcome.

And last, but not least, I think the more exposure we give youngsters as well as staff to the variety of uses that a microcomputer can serve, the better prepared we're going to be - - the better prepared our students are going to be for the future, and seeing this as a tool, that can be adapted to a variety of situations throughout their lives. I think the program shows them that there is nothing foreign between teaching a foreign language and using a microcomputer. It doesn't have to be a video game, it doesn't have to be something that deals only with mathematics, that it can incorporate not only foreign languages in it, but also the English literature, science, history, and the whole realm of academic programs offered throughout an educational institution.

We're pleased!

Dr. R - We're certainly pleased to be here. Our staff observations confirm this is having an effect on the students' use of computers per se in a more serious vein. When the students began the study, we noticed they were just pressing "Return" and just trying to get through the program, almost like playing "Pac Man", to see how many screens they could get through. This was on the very first day. Then we explained to them, the object of this is to learn, and not to get through as many screens as possible, and this is why we have the testing each day. So they are learning that they can learn from the computer.
(Further comments on tape regarding future intentions of study, etc.)

Welsh - Some observations after visiting the lab with the students in there, was that I was impressed with the intensity and the amount of time on task that the youngsters were demonstrating with their behaviour. The second thing that struck me was the motivational level that the students were demonstrating by staying on task. It was a heterogeneous group of youngsters, and being familiar with some of them, I was really impressed with the intensity they were bringing to this particular project. I would hope they would generalize that and transfer that to their other academic courses.

The third thing that impressed me, in talking briefly with a couple of students, is they thought they were doing something very important. Not necessarily with the project, but the fact that they were actually and effectively manipulating a microcomputer in a foreign language. They felt that they were achieving, and the whole aura that this sets for the youngsters, the results are going to be very positive about the study. I think that it sets a tone that is going to pay off in some real learning results for you.

IV. Carollyn Rudesill interviewing Wilga Rivers at our Mills office after attending the morning computer classes.

CSR - How do you think the project went today?

WR - Well, I was very excited to see the students actually working with the computers, and to see the intensity of interest the students were showing, and the way in which they seemed to be concentrating, especially for junior high school students.

CR - Yes, they did.

WR - And they seemed to be enjoying what they were doing. They seemed to be working at it quite intelligently, referring back when they needed to, to review the program, and not just sitting there wondering what to do next. So they clearly had learned how to handle the machines very quickly. I'm hopeful that the results will show some interesting differences in the particular hypotheses that are being tested.

CR - What are the hypotheses that you and Dr. Robinson developed in doing this project.

WR - Well, it was Dr. Robinson that did the initial thinking out of the hypotheses, of course. We refined them together. And the aim is to try to see whether certain techniques developing from certain methodological approaches are more effective than others. We read a lot of literature about the fact that students learn a lot better by one approach rather than another, but as often as not, it is the enthusiasm of the promoter of a particular approach that is being rather over-stated rather than actually having factual information about how the students are learning. So this kind of project, although it is at the moment on a computer, can be extrapolated too, to classroom exercises using a textbook, I should think, because if we can find that there is very little difference between the results from one technique and another, then we can choose whichever is the most efficient from the point of view of best use of time, what the teacher can best do in particular circumstances, so that the study should then be able to give you a guide, give guidelines for materials, production, textbook production, and certainly, most certainly, for computer assisted programs which are being produced by the textbook companies to accompany textbook materials. And so, instead of just following along the lines of certain time-honored, easily programmed types of exercizes, we will have a lot more variety to offer to the students who are trying to learn with the programs, because they can't go on forever just filling in the blanks, and doing multiple choice. They get very bored with that. Especially as the computer age comes along, and they're doing the same thing in science that they're doing in history. There is a limit to the amount that a child during a day can do of exactly the same type of activity.

CR - I can see how that specifically relates to the computer work. But you said you also feel that these results may have an impact on classroom techniques, etc....

WR - Yes. Because if you find out that certain techniques are equally efficient with others, then you have to look much more at purely motivational angles. If they do produce similar results, which ones are most motivating, and also which ones are most possible for the average teacher to implement, because we have to work with the average teacher, not just the brilliant teacher who goes off to all the meetings, and knows exactly what's going on. We have to have the types of approaches that the average teacher with an average sort of training can use effectively.

CR - Very interesting. I would also like to ask about what you might see as the national or international impact of this study. Do you see it having a far-reaching effect on computer technology?

WR - Well, it's like all of these studies. It will have a far-reaching effect if the results are sufficiently published by it. And so of course, as soon as the project is over and the results have come out, apart from the official report which goes in the public domain, which will be available, it is actually essential that the members of the Center then write articles in different journals, explaining to different populations, the indications of the study. And presumably, following up in the second stage implications of these types of conclusions for production of materials.

CR - What did you think of the specific lesson that you saw this morning? Pros or cons, in terms of how it was run and the way students were interacting with their environment?

WR - Well, I think the inclusion of the graphics was definitely a plus. You see so many of these programs that are just dull printing. And in the same age, when we talk about students having trouble with just print media for learning. I think the graphic is very, very important, and certainly it was eye-catching and the sketches were clean, in the sense that the outlines were clear. They weren't cluttered. So it was quite obvious to the student what they were supposed to be working out. And in the problem-solving element, they had to think for themselves, rather than just check off something that was provided. This is, of course, important.

CR - So it was pretty well thought through in terms of how it was dealing with the subject at hand.

WR - Yes.

CR - Is there anything else you would like to say about the project as a whole?

WR - I think that the point that you made this morning, and which has been made before, that teachers have to look upon the new media, the computer and the video disk and so on, as being things that can help improve their teaching, help them to be better teachers, I should say, more effective teachers, to reach their students, to enable their students to learn more effectively. I think that teachers don't have to be afraid that this is going to take away their jobs. At the time the language labs came in, that was the same fear with the teachers -- that technology would do their job for them. In language learning particularly, this will never be so, because language learning is communication and interaction, and you can't have real communication and interaction except with another thinking being, and this whole communication where what one is to respond is triggered by a smile or a look or by a look of incomprehension and so on, and all of this is part of communication. And all of this has to come in the classroom interaction with the teacher and student, student and student. And the work with the computer, I think will be important in that a great deal of the more tedious aspect of language learning, that has to at some stage be mastered: knowledge of vocabulary, knowledge of grammatical and syntactic features -- these things can be done in an interesting way with the computer, and the student who needs to, can spend much longer on it, whereas the student who doesn't, doesn't have to be wearied by waiting for the others to catch up. So then the classroom can be used for the much more interesting and exciting interactive activities. So I see them as a way of improving language teaching, and enabling the teacher to do in the classroom the things that only a teacher can do.

CR.- - That's excellent. That really puts the computer in a support function for the teacher.

WR - Yes. And for the student.

Cr - That's right.

WR - Because the computer, by its nature, is very patient, in the sense that it is willing to repeat over and over again and to shoe the same diagram, to show the same chart, without ever giving the student any sense of embarrassment at having to ask it a tenth time! And so this enables us to realize the dream of the seventies -- to have more individualized instruction, more personalized instruction. And as one has more experience in programming, and as one becomes more innovative and daring in programming, we'll be able to give individual students much more the types of exercises to work with, which they themselves enjoy, that they even perhaps will be able eventually to create some of their own as time goes on.

CR - Great! Well, this project is certainly a start in that direction.

WR - I think so. And I think one only had to see those students working this morning to realize that they were enjoying what they were doing, and that is the first step towards solving any educational problem, is to have students enjoying what they are doing. Really enjoying, and involving themselves in it.

CR - Yes, I think one of the telling features in that was to see how many of the students chose to repeat the exercise a second time, although it wasn't at all required.

WR - Quite, quite.

CR - They were intrigued enough by the activity to want to go through it again, which is nice for a teacher to see.

WR - This is important, because this is what we would always hope they would want to do with their own homework, but it isn't always so.

CR - No, that's a unique aspect for a teacher to see a student asking to repeat work!

APPENDIX H

Program Language and References

The source codes were written in the C programming language, and were compiled and linked into executable programs using the Aztec C system for the Apple II, version 1.05 (copyright Manx Software Systems, 1984).

Each of the ten daily sections corresponding to each day, contains several independent files that were compiled separately and then linked together to form one program. Within the sections, two files always appear, titled "text.c" and "display.c". The C source contained in these two files was written by Richard Bassein for the software package "Juegos Communicativos (Communicative Games)", published by Random House. This source includes most of the initial graphics functions and Spanish character generation functions. In some of the sections, the source in "text.c" and "display.c" was very slightly modified by the Principal Programmer, or unused portions deleted. In addition to the functions in "display.c" and "text.c", the "Juegos" source codes provided a memory allocation scheme and useful structure in which to develop the project software. The Center is grateful to Richard Bassein and John Underwood, co-author, for permission in using this source for research purposes.

Although, except as where noted, the source codes are entirely original, some of the ideas used in the design and appearance of the final product had inspiration in other software packages dealing with CAI in foreign language. These are listed below:

Cloze Master, Christopher Jones

Dasher: An Answer Processor for Language Study, James P. Pusack

DrillShell, Conduit Educational Software

Juegos Communicativos, Richard Bassein and John Underwood

PROGRAMMING STAFF:

Lisa Borden, Principal Programmer
Mary Ivanetich, Assistant Programmer,
Richard Bassein, Programming Consultant