CHAPTER 6

EXPERIMENTAL PROCEDURE

6.1 Overview of the Method Used

The experimental procedure was designed to test the effectiveness of the two CALL lessons under study, to ascertain whether and to what degree the independent variables of choice and control enhanced learning of the use of gerunds and infinitives with the matrix verbs 'stop', 'remember', 'forget', and 'regret' in the two CALL lessons, and to gauge student attitudes toward their CALL experience. Specifically, four hypotheses were tested. These were:

H1: that both CAI lessons would be effective in teaching in each experimental situation,

H2: that the PDL lesson would teach more effectively than the REG lesson,

H3: that use of CAI would result in favorable attitudes from the students, and

H4: that students working the PDL lesson would have more favorable attitudes than students working the REG lesson.

In order to test these hypotheses, research was conducted at two colleges in the Honolulu area: Hawaii Loa College (HLC) and Leeward Community College (LCC). Separate experiments were carried out at each college, first at HLC and then at LCC. The experimental procedure was essentially the same at each location; however, certain changes were made

from one study to the next. The greatest change was that, in the HLC study, the relative effectiveness of the two CALL lessons were measured one against the other; in the study at LCC, the same lessons were not only compared against each other, but also against a control.

At both research sites, students were placed appropriately into groups receiving the separate treatments. Two groups were used at HLC. Designated PDL and REG, these were randomly assigned to the game paddle-enhanced and regular CALL treatments, respectively (see Chapter IV for a discussion and description of the CALL lessons). Three groups were used at LCC, designated PDL and REG as above, and CTL, the control group (see section 6.3.3 for a description of the control treatments at LCC).

The basic procedure used in each case was that students were given the pretest, put immediately on computers to work their designated lessons, and post tested immediately after that. At a later date, they were asked to fill out the follow-up questionnaire. A t-test was applied to the raw scores of the pre and post tests in order to see if there were any significant differences before and after treatment. The questionnaires were evaluated qualitatively, except that a chi square analysis was done on the three retention questions at the end.

In practice, the actual procedures followed at HLC and LCC differed slightly. Therefore, the implementation of the

basic procedure is discussed separately for each research site in the remainder of this chapter.

6.2 The Hawaii Loa College Experimental Procedure

6.2.1 Experimental Setting

HLC has an ESL program for foreign students, who take classes dealing with structure and writing, reading and vocabulary, aural comprehension, and grammar and speech. There are classes for students in "upper" and "lower" levels. Although the ESL department had never made use of it, there also exists at HLC an educational computing center.

The computer center was housed in a single room. There were five Apple II's among the computer terminals ranged about this room. It was arranged for two of the Apple II's to be made available for this experiment. Sometimes, there was a lot of activity in the computer room, with most of the terminals being occupied, and this was sometimes distracting. At other times, subjects in this experiment were the only people besides the researcher and the room monitor using the computer room.

6.2.2 Subjects at HLC

Twenty-four students of ESL participated in the HLC portion of the experiment. These were all the ESL students who were available at the times the researcher was able to be on campus (in fact, it was all but two; one of whom was

eliminated because she inadvertently failed to complete the pretest, and the other because she sought help on her pretest from another student). The students came from Japan, Korea, Macau, Hong Kong, Palau, Tonga, Ponape, and Truk. Eleven of the 24 subjects had never used a computer before, and only five had used a computer more than twice.

All but two of the subjects had recently taken the 1961 version of the MTELP, and their scores averaged 54.33, with a range of 37 to 77. MTELP scores for two of the students were not available, so these scores were estimated by an instructor who taught the two students and who had a good working knowledge of the relationship of MTELP scores with performance in the program. For the purpose of the experiment, the students were considered to compose a homogeneous group.

6.2.3 Assignment to Groups

For a number of reasons, it was not practical to randomize in the conventional way, with the composition of each group being determined in advance. One reason was that classes were small and attendance was erratic, making it uncertain who would be in class at a given time. Time was a major consideration, especially as it was possible to deal with only two students simultaneously throughout the experiment. This was the maximum number that the researcher could efficiently handle, and also as many as the computer

room could comfortably bear at one time. Since each student took about an hour to pass through either treatment, in order to treat 24 subjects, it was necessary for the researcher to interrupt classes at HLC over five different days. As this in turn disrupted routine in these classes, it was of paramount importance to complete the research in as short a time as possible. Therefore, the following method of randomization was used.

The researcher made a chart with two columns, labelled PDL and REG. (No CTL group was formed from the pool of students at HLC because there were not enough students to make up three groups of sufficient N-size.) Just before a class began, the teacher's grade book would be taken and names picked out by pointing blindly at the page. The name that happened to be under the researcher's finger wherever it landed in the grade book would be written in the next space on the chart, going down one column to the next (the first name was assigned a column by coin flip). When four or five names had been selected in this way, one PDL group student and one REG group student would be chosen to accompany the researcher (this constraint being forced by the configuration of computers available; one had game paddles attached, and the other didn't). Students thus chosen for treatment at that time were those (a) whose names were nearest the top of their respective columns, and (b) who were present in class

on that day. It was usually possible to get a second pair of students from the same class by taking the next names on the chart, but for different classes meeting at different periods, other names would have to be selected in the same manner from the appropriate gradebooks.

Hence, students were randomly assigned to PDL and REG groups. Assignment was random because it was made independently of any student's name or physical appearance, and because names selected were assigned treatments by coin flip.

6.2.4 Treatment at HLC

6.2.4.1 Administration of Pretests

Whenever a pair of students was selected in the above manner, each student was given a pretest. Students were allowed to take however much time they needed with both the pre and post tests. Students took anywhere from seven or eight to fifteen minutes to complete these tests, with most students taking about ten minutes.

Since the entire available population of ESL students at HLC was being used in the experiment, it had not been possible prior to the experiment to administer the pre and post tests to a sample of that population, thereby determining in advance how long it would take them to work the tests. The fact that students had such a wide range of proficiencies also made it difficult to arrive at an

appropriate time frame for the test. The test appeared easy for some students, but others puzzled over the questions and complained that they couldn't understand the vocabulary (and were told to do their best). Therefore, it was apparent that the time needed for the pre and post tests would vary widely from student to student.

Other factors precluded controlling the time students spent taking the pre and post tests. First, it was important for as many students in the population as possible to take the tests under experimental conditions, and therefore undesirable to force any student to hand in a paper before he had finished the test. This would have invalidated that exam. It was therefore impractical to set a time limit beyond which students would not be allowed to work. On the other hand, it was also impractical to require students who had already finished a pre or post test to remain sitting in the testing area for a predetermined amount of time. This was because space limitations made it necessary for subjects to sometimes sit at tables outside the computer room, and their friends were prone to chat with them if they were sitting idly.

Although students were in general very cooperative, the researcher had limited authority over them, and they could not be made to sit silently at tables with their friends chatting and smoking nearby. The researcher had even less authority over the friends. It was not possible to prevent

interchanges between students by monitoring all students at all times, since the researcher often had students simultaneously outside testing and inside working on computers. Students on the computers had to be helped to start and told when to finish, preventing the researcher from constantly monitoring students testing. As long as the subjects were working on the test problems, it was "safe" to leave them alone. But once they had finished, it seemed prudent to collect their papers and get them into the computer room. It was under these conditions that a subject left alone for a few minutes was suspected of receiving help from another student, which in turn led to her participation in the experiment having to be curtailed.

6.2.4.2 Administration of CALL Lessons

Although time could not be held constant for the pre and post tests, all students in the experiment received exactly 35 minutes on their respective computer treatments. Once the subjects had been administered pretests, they were ushered into the computer room where they began working the CALL lessons. Timing began from the moment the students sat down at the terminals, so that 35 minutes was the entire amount of time that each student had with the computer, including whatever time it took for familiarization and for understanding lesson protocol. In this way, time was itself controlled out as a factor in the experimental treatment.

However, how the students used their time may have been a factor, as will be discussed later.

Each of the terminals awaiting the students displayed a title page with a message at the bottom of the screen reading: "Press RETURN to begin". The students were given a moment to read what was on the screen, and then told that the computer would give them all further directions. It was then pointed out that the first instruction was to press the RETURN key. The researcher indicated this key on the keyboard, and paused until the student realized that he or she was supposed to press it. The procedure from this point depended on whether the student was in the PDL group or in the REG group.

In general, the REG group students had no trouble beginning their lessons. The REG program was self-explanatory, and movement from one step to the next was always at the press of a single key. Only rarely was the researcher asked a question by any of the REG group students. Once into the lesson, these students had to work 32 problems, pass successfully through the five-item quiz, and then work through the recapitulation and rules portion of the lesson. At the end of 35 minutes, when students were asked to terminate their work, some had barely finished the entire lesson. One student had only reached question #20, and two others were able to progress only slightly further. On the

other hand, one student worked the lesson twice in 35 minutes, and others had finished the lesson and been asked to restart.

In contrast, the PDL group students had to have explained to them how to use the game paddles to form their choice of the 32 sentences that could possibly be constructed from the chart. However, these students started the lesson much as did those in the REG group; that is, they paged through a set of instructions on how the computer expected them to answer questions, and they were introduced to Max, just as were the REG students. They only difference in the two lessons at this stage was that part of the PDL group instructions explained how to use the game paddles. Some of the subjects in this group opted to read these instructions, but all were told by the researcher not to worry about them, and that the researcher would explain to them how to operate the game paddles once they had reached the appropriate point in the lesson.

When the chart from which the PDL group students were to form sentences appeared on the screen, the researcher showed the students how the knobs on the paddles manipulated the cross-hairs that formed on the chart, and how the buttons registered the position of the cross-hairs with the computer. The researcher would ask each student to select the matrix verb for a sentence, and the researcher would then center the

cross-hairs over the sentence beginning with that matrix and press the button on one of the paddles. The researcher would then point out that the red light on the disk drive was on because the computer was getting information from the disk (this in order to explain the slight delay, and to show the student that something was visibly happening with the computer). The student was then invited to manipulate the game paddles on his own to complete the sentence just begun. In so doing, each student adjusted the knobs and pressed a button with the researcher looking on.

Once students had successfully centered the cross-hairs and pressed a button to make a selection on their own, they were left alone to work the problem associated with their choice. The researcher retired to a table in the middle of the room, in back of the students working at the terminals. The table was so positioned that the researcher could see what the students were doing without the students being able to see that they were being watched. The researcher could thus stay alert to any problems the subjects, particularly the PDL group subjects, were having with their lessons.

The most common problem was that subjects would successfully manipulate knobs in selecting a matrix verb but fail to press a button to indicate this choice to the computer before selecting a complement verb. This resulted in a message to the effect that an improper choice had been made

(the computer, unaware of the choice of matrix verb, had assumed that a complement verb had been selected as the first choice). The researcher would step in as soon as this or any other problem was encountered, so that the PDL students would be set right as quickly as possible. In this way, it was hoped to minimize the time required for orientation to the computer and to maximize the time the PDL group students would spend actually working problems at the computer.

Once they had learned to successfully form sentences by using the game paddles to pick sentence components off the chart on the screen, PDL group students typically spent whatever portion remained of their 35 minutes experimenting with various sentence combinations. Only a few exercised their prerogative (given them at the end of each problem) to exit the chart mode and work through the final quiz, rules, and recapitulation. Some had difficulties with understanding the sentence formation process and, by the time they got to where they could work the game paddles properly, had as little as ten or fifteen minutes to actually work the lesson. Conversely, others worked the quiz and recapitulation before the time had finished, and had to be asked to restart.

6.2.4.3 Administration of Post Tests

At the end of 35 minutes, students in both groups were asked to stop working at the computer and to take the post

test. As with the pretest, and for the same reasons, the post tests were not timed. However, students typically spent about ten minutes on the post test.

6.2.4.4 Administration of Questionnaires

Questionnaires were administered to students during their regular class periods approximately two weeks after their experimental treatments. Administration was carried out over a day or two. No attempt was made to control the times at which students took the questionnaires (according to when they had undergone their treatments) as this would have further inconvenienced class routine at HLC. Also, scheduling and erratic attendance at HLC made it impossible for students to all fill out the questionnaires at one sitting, or even on the same day.

6.2.4.5 Re-administration of Post Tests

Finally, in an attempt to assess whether retention of the material learned was any better with one group, the post test (that is, the test the students had taken immediately after having undergone their experimental treatments) was re-administered. This was done about a month after the experimental treatments had ended. By then, five of the students in the PDL group were no longer in attendance at HLC.

6.3 The Leeward Community College Experimental Procedure

6.3.1 Experimental Setting

Students in the Program for the Advancement of Study Skills (P.A.S.S.) at LCC were used in the second experiment. The P.A.S.S. program was housed in its own building. The computer was in an interior room, the door to which could be closed so that each student could have complete privacy, free from all distractions. In another room, there were several carrels at which students could work on the pre and post tests and not be bothered by other students. Given this environment, the researcher was able to conduct a more rigorous experiment than had been possible at HLC. It was possible at LCC, for example, to adhere to a time frame of ten minutes for the pre and post tests.

6.3.2. Subjects at LCC

All students (except transfer students) entering Leeward Community College take the Nelson-Denny test of vocabulary and reading comprehension. Students whose raw scores on this test are below 51 (grade level 10.5) are encouraged to enroll in P.A.S.S., where they are given a semester of remedial training in reading, writing, math, and study skills. Thus, the students in this experiment were for the most part not ESL students. Except for a Japanese speaker married to an American, a Spanish bilingual from Texas, and a student from American Samoa, all were native English speakers. However,

all the LCC subjects were deficient in skills for coping with English in an academic environment. Accordingly, the material in the CALL lessons was reviewed and deemed appropriate for these students by the acting director of the P.A.S.S. program.

6.3.3 Assignment to Groups

Since there were 80 students in the P.A.S.S. program, another of the constraints that had prevented a more rigorously controlled experiment at HLC did not exist at LCC. For one thing, there were enough students to distribute among 3 groups (instead of the 2 at HLC): PDL, REG, and CTL. The first two groups received the appropriate CALL lessons, while the CTL group performed activities on the computer unrelated to work with gerunds and infinitives (actual treatment consisted of a battery of CALL lessons developed at LCC giving practice in sentence construction skills). In this way, it was possible to control for the possibility of a Hawthorn effect with the other two lessons. Also, the control group allowed a check on the degree to which post test scores might have improved simply because students had had time to reflect on the subject matter in the tests.

Since students were to be put on the computer during scheduled study hall periods (i.e. no interruption of class was necessary), it was convenient to randomly put the students into their three groups prior to beginning the

experiment. Working from a class list of all 80 students in the P.A.S.S. program, the researcher went down the list and put every fourth name starting from the first name on the list into the PDL group, every fourth name starting from the second name on the list into the REG group, and every fourth name starting from the third name on the list into the CTL group. The remaining 20 names (every fourth name starting from the fourth name on the list) were not used in the experiment except as a pool from which to draw replacements. This was necessary when one student became sick just after taking the pretest, and when another student was identified as lying outside the experimental group. (The Nelson-Denny score for the latter student was 121. Since this score was almost twice the next highest Nelson-Denny score, and 2.5 times the group mean, this student was rejected from the study.)

6.3.4 Treatment at LCC

Since there was only one computer in the P.A.S.S. program at LCC, the researcher would simply find an available student, give him or her the pretest (for exactly ten minutes), administer whichever computer treatment the student had been allotted (for exactly 45 minutes), and then give the post test, again for exactly ten minutes. Students who finished either the pre or post test before ten minutes were up were required to review the test until this time had elapsed; no student needed longer than ten minutes.

Aside from the timing of the pre and post tests, there were other differences in the procedure from that used at HLC. These were deemed necessary on the assumption that at HLC, students had not received the full benefit of the CALL treatments in 35 minutes. Students in the REG group had not always been able to finish the lesson in 35 minutes, and by the same token, students in the PDL group had often not had time for the rules and recapitulation portions of their lesson. Since results from the HLC study seemed to indicate that working these portions of the lessons had some bearing on student performance on the post test, two changes were made in the experimental procedure at LCC.

First, time on the computer was extended to 45 minutes for each student. Students attempting to leave the computer before this time had elapsed were requested to restart their lesson. Second, 35 minutes into their lesson, PDL group students were asked (if they hadn't already done so) to exit the chart mode and work the quiz, rules, and recapitulation sections. These two changes would virtually assure that each student worked some (and in the case of the REG group students, all 32) of the problems plus the quiz, rules, and recapitulation sections at the end of each lesson.

After working the pre test, the CALL lesson, and the post test, one right after the other, students were at a later date given questionnaires to fill out. The number of

days between treatment and questionnaire varied from student to student. The first students to work the CALL lessons at LCC got the questionnaires about a week after treatment. However, when the experiment ran into the last week of school (due to unforeseen delays), the questionnaire had to be administered to some students the day after treatment. Thus, time between treatment and follow up questionnaire was not controlled out of the experiment.