Why were these lessons shown to be so effective? Again, we must consider the level of the students and the amount of time they worked at the computer. Contrary to the situation at HLC, students at LCC were almost all native speakers of English. It is not unreasonable to assume that they had almost all had prior knowledge of the linguistic features in question, but that this "knowledge" had not been activated until they had undergone treatments which clearly set forth the rules for these features. Thus, these students scored on average 35 out of 40 on their pre tests (Tables 4, 5, and 6), and better than 38 out of 40 on the post tests (Tables 4 and 5). Due to possible ambiguities in some of the sentences on the instruments used, 38 can be considered to be a "perfect" score (that is, the two problems "missed" may have had ambiguous interpretations). According to this criterion, all but three PDL students and all but two REG students were brought up to "perfection" by the experimental treatments.

Time was another possible factor in the success of the lessons at LCC. Due to the fact that students at HLC had not always finished their lessons, two changes were made in the LCC study. First, students were to be kept at the computers for 45 minutes instead of 35. Second, all PDL group students were now to be notified ten minutes before time was up so that they could begin working on the recapitulation, if they hadn't already done so. By

implementing these changes, it was hoped that all students would complete the lessons, including recapitulations. (Indeed, all but two students, one in the PDL group, and one in the REG group, reported doing so -- Table 9, Question #4.)

There is also a possible explanation for the fact that the REG lessons appeared, after statistical analysis, to be more effective than the PDL ones. As was noted previously, there existed the possibility that the PDL group had originally been somehow better at gerunds and infinitives than was the REG group. In addition to this evidence, it can be seen (Tables 5 and 6) that the mean pre test scores of the PDL group were more than a point higher than those of the REG group, and that this mean was within five points of the highest possible score (40). Hence, it can be argued that there was a ceiling effect in operation which reduced the difference in means between the pre and post tests for the PDL group. This may have been the reason for the lower t value for the PDL group scores when compared with the t value for the difference in test scores for the REG group.

Thus, it is not surprising that the t value found for the difference in pre and post test means for the PDL group was not higher than it was. It stands to reason that students brought to near perfection from relatively high

pre test scores will appear to have made smaller gains than students brought to approximately equal levels from lower pre test scores. This has apparently been the case here. By the same token, it is not surprising that at LCC, both experimental lessons were effective with almost all the native English speakers in the study. It seems logical that these students were reminded of linguistic features that they had previously encountered and, after having worked the lessons, were better able to solve problems dealing with these linguistic features.

7.2 Qualitative Findings

7.2.1 Qualitative Results at HLC

A questionnaire (Appendix D) was distributed among subjects in each study in order to elicit reactions to using the computer as a means of instruction. This was done at HLC about two weeks after completion of the experimental treatments. Analysis of the questionnaire revealed generally favorable attitudes, with those having worked the game paddle lesson giving the computer generally more favorable marks than did those who had worked the REG lesson.

As has been mentioned previously, only five students in the HLC experiment had used a computer more than twice before, and eleven had never previously used a computer at all (Table 8, Question #1; all references to question numbers in this section may be found in Table 8). Consequently, 15 of

the 24 students at HLC (6 PDL and 9 REG) said they had initially been a little worried about having to use a computer. On the other hand, six students (five of them PDL) reported that they had initially wanted very much to use one (Question #2).

After having worked the CALL lessons, all students at HLC who had indicated a predisposition toward working with computers said they liked using the computer very much. In addition, all but one of the PDL students who had expressed initial concern about using the computer ended up liking the computer very much. However, only five of the nine REG students who had originally expressed concern finished the experiment with the same enthusiasm. The other four (along with one student who had said he was originally neither worried nor excited about using the computer) noted that they never overcame their initial discomfort. In contrast, only one PDL group student at HLC reported that he had never quite become comfortable with the computer (Question #3 -- the preceding analysis derives from matching Question #2 with #3 on the original questionnaires that the students filled out).

All but three of the REG group students at HLC rated their experience with the computer as being interesting and positive (Question #7). These three rated the experience only mildly interesting. Furthermore, each of these three

had expressed initial concern about using the computer, and two of these had remained uncomfortable throughout the experiment. All but three of the PDL group students found their computer experience to be interesting and positive (Question #7). Of these three, one was the student who had remained uncomfortable throughout the PDL lesson, while one had initially wanted to use the computer and ended up liking it very much. (The other PDL student had been ambivalent about his predisposition to using the computer and about his reaction to it.)

Another indicator of how much the students liked the lessons was their reaction to being told to start it again (Question #4). Seven students in the study noted that they had restarted the lesson (i.e., they said "there was too much time in the lesson" and therefore, they had to restart it). Of these, four (two each, PDL and REG) didn't mind restarting the lesson, but three (two PDL and one REG) had been ready to leave before their time was up. In addition, two PDL and five REG students would have liked to have had more time to work, even though they finished the lesson. Six PDL students felt the time allowed for the lesson was just right, as opposed to just one REG student. These last data in particular seem to indicate that more PDL students felt satisfied with their time spent on the computer than did REG students.

Students were also asked to comment on their reaction to the game paddles. One of the questions (#5) asked the students if they were satisfied with their lesson or if they would rather have worked the other kind. Students were evenly split on this point; approximately half of both the PDL and REG students liked the lesson they had worked, but the other half thought they would have preferred to work the alternative lesson. However, on still another question (#10g), 11 of the students who used the game paddles said they liked using them, while only two didn't.

Since the lesson with game paddles was supposed to allow students freedom of movement within the lesson, there was a question verifying whether this was so on the questionnaire (#10f). Ten PDL students said they had easy movement within their lesson, as opposed to only six who felt the same way about the REG lesson. In addition, four REG students, as opposed to only one PDL student, felt that movement was difficult within that lesson. This was as expected, since the PDL lesson allowed students to jump at will within the lesson, whereas the REG lesson didn't.

By approximately the same proportion, more PDL students said they generally knew what to do next in their lesson, while more REG students were not sure what to do next (Question #10d). This was not the expected result, since the REG lesson was designed to be fairly foolproof, with any

next step in the lesson accessible through the press of a single key. PDL group students, on the other hand, had to make more complex manipulations of knobs and buttons to move around within their lesson. The researcher observed difficulties with these manipulations, while the REG students were observed to have moved through their lessons with few apparent problems. It is interesting therefore that almost all the PDL students said they knew what to do next, but that half the REG students expressed confusion here.

Less surprising was the fact that nine REG students felt in control of their own learning as opposed to only seven PDL students (Question #10a). On the contrary, four PDL students (and one REG student) were of the opinion that the experimenter prevented them from working by themselves as much as they would have liked. This was true especially if they were having trouble. The experimenter would, for reasons already mentioned, try to come to their aid as soon as possible, and four PDL students considered this to be interference in their learning.

Several questions addressed the degree of difficulty of the instructions and vocabulary used in the lesson (Question #6, #10b, and #10c). Approximately the same number of PDL students as REG students said the instructions were just right (8 and 6, respectively), complicated but necessary

(4 and 4), or complicated and unnecessary (1 and 1). PDL and REG students were just as evenly divided on readability of the instructions, with 9 and 8, respectively, saying the instructions were easy to read. Only one from each group said there was too much to read in the lesson (and neither of these respondents had earlier said that the instructions were unnecessary).

However, vocabulary seems to have been easier in the PDL lessons. All 13 PDL students, but only 6 of the REG students, said that vocabulary was no problem for them. Three of the REG students went so far as to say that they couldn't understand the vocabulary in the computer lesson. Since the problem, quiz, rule, and recapitulation sections of the REG lesson were exactly the same as those in the PDL lesson, the difficulties with vocabulary must have been on one or more of the instructions pages. This may or may not have posed a problem for the three REG students who had difficulty; as has been noted, the lessons were designed so that one could move through them without having to understand all the vocabulary, and REG students were observed to move rapidly through these lessons. Perhaps there was some confusing point in the REG lesson instructions that kept the REG students from knowing what to do next, even though they apparently resolved the problem with the press of the right key. The researcher believes that this

possible source of confusion was the chart, which, as was explained in Chapter 4, had been introduced into the REG lesson for no reason except to establish parity between that lesson and the PDL one.

Students were asked what they felt they had learned from the experiment (Question #8). As might be expected, the students' self assessments of their learning did not always agree with the results noted on their pre and post tests. For example, in comparing individual replies on questionnaires with the students' scores reported in Tables 1 and 2, we find that the one student in the HLC study who said he learned nothing about English (a PDL group student) improved by an impressive 6 points from pre to post tests. Except for one student who made an 8 point gain, the four PDL students who professed to learning a lot of English posted modest 2, 3, and 4 point gains. One of the remaining PDL students, who said they learned something about English but not much, was S10-PDL/HLC, who had on her post test doubled her pre test score.

REG students reporting on their own learning did little better than the PDL students. Nine felt they hadn't learned much about English. Of these, four did indeed score below their pre test scores, but the remaining five scored 2 to 6 point increases. The remaining two REG students said they had learned a lot, but one of these dropped by four points

while the other increased by only a point on his post test. Thus what students said about their own performance was not generally corroborated in cross-checks with the other data available.

7.2.2 Qualitative Results at LCC

Subjects at LCC differed from those at HLC in two important ways. First, as has already been pointed out, they were for the most part native speakers of English. Second, most had frequently used the computer on the P.A.S.S. premises in other aspects of their remedial English and math training. Seventeen of the 20 students in the two experimental groups at LCC had used computers several or many times before (Table 9, Question #1; all references to question numbers in this section may be found in Table 9). Two had used a computer only once before and only one student, S7-REG/LCC, had never used a computer before. Thus, the students at LCC in general approached both the subject matter and the computer much differently than did the HLC students.

The questionnaire was distributed among subjects in the PDL and REG treatments at LCC anywhere from one week to one day after completion of the experimental treatments (CTL students were not given the questionnaire). This disparity in the time intervals between treatment and follow up was necessitated by the fact that the semester was ending at LCC,

and the last students to get the treatment were matriculating from the program just days later. Analysis of the responses to the questionnaire revealed generally less favorable attitudes toward this particular experience with CALL than were shown at HLC (see Table 9).

Seventy-five percent of the students at LCC thought the CALL lessons were either interesting and positive or mildly interesting; however, 3 students thought they were a waste of time (Question #7). Two of these were in the PDL group. Looking at their individual questionnaires, we find that both had initially been neither worried nor excited about using the computer. S5-REG/LCC, on the other hand, a student in the REG group, had initially wanted to use the computer very much. He ended up liking the computer, yet thinking the lesson was a waste of time. Interestingly, the lessons probably weren't a waste of time for S5-REG/LCC, since he improved from 31 to 36 on his pre and post test scores (Table 5). The two PDL group students who thought the lessons a waste both scored 39 out of 40 on the post tests, up from pre test scores of 34 and 36. Thus, the 3 students who thought the lessons a waste of time all showed substantial gains in knowledge of the subject matter taught.

Like the two PDL group students mentioned above, half the students at LCC said they had initially been neither worried nor excited about using the computer (Question #2).

Two REG students, both of whom had used computers several times before, said they were a little worried at first about using the computer. One of these latter students never got comfortable with the REG lesson but thought the overall experience was mildly interesting; the other said that using the computer was neither great nor bad, but that overall, it was a positive and interesting experience.

Two students, S7-REG/LCC and S8-PDL/LCC, had not wanted to use the computer initially. From the questionnaires they submitted, we find that their final impressions were that the experience wasn't great, but not bad either (Questions #2 and #3). S8-PDL/LCC said that he thought the PDL lesson had been an interesting and positive experience; S7-REG/LCC felt that the REG lesson had been mildly interesting, but not a waste of time (Question #7). Hence, students who had originally been negatively predisposed toward using the computer showed positive shifts in attitudes similar to those made with many of the students at HLC.

Six students at LCC initially wanted to use the computer very much. Two of these were in the PDL group and, again tracing subsequent responses on their individual questionnaires, we find that both liked using the computer very much, and that one thought the experience overall was interesting and positive, while the other thought it was

only mildly interesting. The four REG group students who were initially very predisposed toward using the computer had more mixed feelings after working the lessons. S5-REG/LCC (mentioned above as having improved from 31 to 36) ended up thinking the lesson was a waste of time. Another of these students said the experience was not so interesting, but not so bad either. Still another said he liked using the computer very much, but that the experience overall was only mildly interesting. The remaining student said the computerized lesson was neither great nor bad, but that overall, the experience was interesting and positive. Thus, we find that for the two PDL students who had gone into the experiment with high expectations, these expectations were met. Furthermore, we find that two REG students had similar outcomes to their expectations, but that the original high expectations of two additional REG students were not met.

Eight of the students at LCC, four in each group, said that the time for working the lessons was just right. Two students, one in each group, said that they didn't finish the lessons. The remaining ten students, five in each group, apparently finished the lessons and had to restart. Three of the PDL group students and all five of the REG students said that they had been ready to leave at that point, but two of the five PDL group students said they didn't mind restarting their lessons (Question #4). In addition, the researcher observed that students in the REG

group often complained about having to stay in the computer room for 45 minutes, while students working the PDL lessons were less likely to register such complaints. These may be indications that the PDL students were more interested than were the REG students in what they were doing.

Three-fourths of the students at LCC felt that it was easy to move around within their CALL lessons. One REG student said that movement was difficult, and three PDL students and one REG student said that movement was neither easy nor difficult (Question #10f). Even more students said they always knew what to do next. All the REG students felt this way, as did all but two of the PDL group students (Question #10d). Almost all students likewise felt that they were always in command of their own learning throughout the experiment (Question #10a). Since they were by themselves in a closed computer room, and since they generally understood the lesson instructions and were familiar with the operation of computers, they neither needed nor requested the presence of a monitor, and so worked largely to themselves.

Fourteen of the 20 students (8 PDL and 6 REG) felt that the instructions were just right. Three REG students and one PDL student felt that the instructions were complicated, but necessary. One REG student thought the instructions were complicated and unnecessary, and one PDL student said

the instructions were incomprehensible (Question #6). Accordingly, fifteen students said the instructions were easy to read, the five exceptions being 2 REG students who said there was too much to read and 3 PDL students who would not say that the reading was easy or that there was too much (Question #10c). Sixteen of the students felt that vocabulary was no problem, with one REG student saying he didn't understand the vocabulary (Question #10b). In this respect, the LCC students agreed with the HLC students that where problems occurred with vocabulary, these were in the REG lesson.

Students were more positive about what they had learned after having worked the REG lessons (Question #8). Six of these students said they had learned a lot, with the remaining four saying they had learned something, but not much. In contrast, only three PDL students felt they had learned a lot from the lesson, and one of these was the one student in the group of 20 to show a reduction in score from pre to post test. Five PDL students thought they had learned something, but not much, and two students said they learned nothing about English. These last two students scored respectable gains of 3 and 5 points from pre to post tests. Although these data may be indicative of student attitudes, as at HLC, many students at LCC turned out to be poor predictors of their own performance on the post tests.

A final group of 3 questions (#11 a, b, and c) on the follow up questionnaire posed problems similar to those in the CALL lessons themselves. Eighty percent of these questions were answered correctly, so that little distinction was possible between the performances of those who had undergone the PDL and REG treatments. The resulting chi square value indicates negligible discrimination ($\chi^2 = .052$; d.f. = 1; $p > .10$).

The information in the preceding paragraphs suggests that students in the PDL group were slightly more interested in their lesson than were those in the REG group. Furthermore, nine of the ten PDL students said they liked using the game paddles (Question #10g), and eight said they had preferred working that version of the lesson (Question #5). In contrast, half of the REG group students said they would rather have used the PDL version. Thus, it appears that the students in the PDL group had more favorable attitudes after treatment than did those in the REG group, but the evidence for this is not overwhelming.

7.2.3 Overview of the Qualitative Data

The studies undertaken at HLC and at LCC were in many respects markedly different in their qualitative aspects. On the one hand, there was at HLC a population of ESL students for whom working the lesson on gerunds and infinitives, whether a confusing or valuable experience, was

at any rate a challenge. For these subjects, use of the computer was a novelty, and whether the students approached the computer enthusiastically or with trepidation, they came away by and large pleased with their experience. Even if they were not able to grasp the grammatical material in the lesson itself, they all felt they had learned at least something from the computer, and none thought they had wasted their time.

On the other hand, the students at LCC did not all find the subject matter in these lessons appropriate to their needs, and thus, they were not all challenged. Many appeared bored. To many of these students, this project was one of many educational experiences they had had on the computer, and they had grown to be demanding of high quality educational software. Hence, more than half characterized their experience as "not great, not bad either". Although 15 out of the 20 thought the experience was either interesting and positive or mildly interesting, the remaining five thought the lessons were either not interesting or a waste of time.

Given the great differences between the abilities and expectations of the two populations, one must be wary of conclusions drawn from a composite of the two groups. However, with this qualification borne in mind, it is useful to see what aspects of the study are highlighted across the

two groups (see Table 10 for an overview, and to refer to the question numbers given below).

First, fully half the 44 subjects at the two colleges said they liked using the computer very much (Question #3). More than half (25) felt that the experience had been interesting and positive, while another 14 said it had been mildly interesting and not a waste of time (Question #7). Thirty-three of all the students said that they had felt in control of their own learning and that they had been able to work at their own pace (Question #10a). Considering that the questionnaire was written so that there was a range of attitudes to choose from on every question, the computer seems to have been very well received by the students in the survey.

The game paddles also seem to have been fairly well received, despite the fact that they were relatively complicated to use. Twenty of the 23 students who used the game paddles said they liked them (Question #10g). Comparing the two lessons, 15 PDL students said they preferred working that lesson as opposed to only 9 REG students who liked their lesson best (Question #5). Fourteen of the 22 students who, after treatment, liked the computer very much were in the PDL group, while six of the seven students who never became comfortable with the computer were in the REG group (Question #3). Also, 14 students who said they had had an

interesting and positive experience were in the PDL group, as opposed to 11 who had worked the REG lesson (Question #7).

These differences, while neither striking nor conclusive, lend credence to the argument that a mentally engaging approach to CALL is better received by students than is one bordering on drill and practice. Also, there is evidence here that CALL is liked and appreciated by students, and this evidence could be useful to those espousing implementation of CALL in situations where languages are taught. There is also evidence that the more experience students have in using computers, the more difficult they are to please. This latter finding will hopefully challenge developers of educational software to follow appropriately reasoned approaches, such as those suggested in the first two chapters of this thesis, in creating courseware that will stand the test of discriminating use.