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IMPROVED EFFICIENCY OF LEARNING PROJECT. LIBERIA

1982 ACHIEVEMENT TEST RESULTS

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INTRODUCTION

The Improved Efficiency of Learning (IEL) Project is a joint effort by USAID/Liberia and the Liberian Ministry of Education to improve the quality of primary education in Liberia. IEL has been producing programmed instruction materials over the past five years. The materials, which consist of programmed teaching for the first 2 1/2 years of primary school and programmed learning for the last 3 1/2 years, are being produced in the project office in Gbarnga. Technical assistance and administration of the USAID component are being provided by the Institute for International Research of Bethesda, Maryland.

From the experimental point of view the project has chosen 3 types of schools. The first type consists of schools using the IEL materials and receiving IEL teacher training and supervision. The second type consists of optimum conventional schools (OC), which are to receive a full complement of regular school textbooks and equivalent teacher training and supervision. We have had great difficulties in buying the textbooks, however, and as of the end of 1982 there were no textbooks in the OC schools. Five OC schools should have had textbooks at the beginning of 1981; we have finally distributed the textbooks for the 1983 school year. For the purposes of the present report the only difference between OC schools and other Liberian schools is that the OC teachers received a 2-3 week training course at the beginning of 1981. The third type of school is the status quo (SQ) school, which receives no treatment at all except for the achievement tests given at the beginning and end of the school year.

The IEL project chose 15 schools for participation in the first phase of the experiment, 5 schools in each of the 3 groups. Beginning in

1983 there are 30 additional schools, 10 in each group, for a total of 45 schools. The schools were chosen in the following way. All of the schools in the experimental region, Bong County plus parts of Lofa and Nimba Counties, were divided into cells according to criteria of school size and achievement based on the results of a sixth-grade examination. Each cell contained 3 matched schools, which were then selected at random so that one school from each cell would be included in each of the IEL, OC, and SQ groups. Pretests have been administered in 1981 for grades 1-3, and 1982 for grades 1-4, in the areas of language (English) and mathematics. The posttests, results of which will be described in this report, were given in grades 1-4 in 1982. Posttests were administered in English and mathematics in all four grades, and in social studies and science in grades 3-4 only.

TEST DEVELOPMENT AND ADMINISTRATION

Planning for the posttests began in September 1981. In order to make an impartial evaluation AID asked that the posttests be designed, administered, and analyzed by independent parties. These parties are the West African Examinations Council (WAEC, Monrovia office) and the present consultant. Also involved in the planning and design of the tests is Chris Agbenyega, an IEL staff member who has worked on teacher taining at the Ministry of Education and has not been involved in the development of IEL materials. During September 1981 we formed a committee of about 10 Liberian primary school teachers to determine the content of the tests, which are based on the official Ministry of Education curriculum, and to help write a large pool of test items for all of the tests, which was to contain about 2-3 times as many items as would finally be used. The writing and editing

of the initial items was carried out between September 1981 and January 1982. In May 1982 the items were tried out in a number of Liberian schools outside the experimental region. The results were scored by WAEC, and I made the item selection based on the results. In September 1982 the WAEC, Dr. Agbenyega and I prepared the final version of the tests, which were subsequently given in November 1982, about two weeks before the end of the school year.

The tests consist of about 30-60 items each, most of which are multiple choice except for some items in mathematics and English for which there is a unique short answer. In grades 1-3 the tests are given by cassette tape, with a minimum of written material, because of the limited reading skills of the students. Beginning in grade 4 the instructions are written, on the (not always justified) assumption that students are able to read simple instructions. All student answers are written in the test booklet as we felt that machine scored answer sheets would be too complicated for the students.

In order to minimize the effect of a probable advantage in test taking skills by the students in the IEL schools we decided to give a series of 3-4 sets of practice tests in all school, at intervals of about 2 weeks just before the administration of posttests. These tests were to be designed and distributed by the evaluation section of the IEL project. However, because of time and resource problems in 1982 only one set of practice tests was given. There was an additional problem in that WAEC would not release any information about the posttests so that the IEL staff had no idea of what format to use on the practice tests. I recommend that for 1983, WAEC give IEL information about the various formats on the posttests, although not any particular items.

The actual administration of the posttests in November 1982 was carried out by a group of 15 teachers, mostly from the Monrovia area, trained and supervised by WAEC. Each of these teachers was responsible for the entire set of 12 posttests to be given at one of the 15 schools in the experiment in 1982. There were a number of problems, especially in the use of tape recorders and taped instructions, but also in wrong packaging of materials. Most of these problems could have been prevented by more careful planning and perhaps more extensive training for the test administrators. A detailed discussion of the implications of these problems and recommendations for 1983 testing will be presented in the conclusion of this report, after examining the test results. In some of the schools there were also complaints that the instructions should be repeated again, even though the important part of each instruction was repeated once. Many of the comprehension problems, including the problems in listening to taped instructions, are in large part due to the generally low level of English comprehension of the students, whose native language is not English.

ANALYSIS OF RESULTS

In the following sections the results of each of the 12 posttests will be described. After that there will be a short discussion of the overall results. Each section will include tables and figures for that test. The relatively small number of schools (5) in each group presents a problem for the analysis of the results. This is because there is such great variation in school size and performance among the various schools. On the one hand, if the results are analyzed using the individual student as the unit of analysis then a single large school can almost determine the outcome for the group. Thus, one school in each group, if that school is unusually good or

unusually bad can dramatically raise of lower the outcome of that group. On the other hand, if we use the school as the unit of analysis then a few students in a small school (some of the tests have only 3 or 4 students from particular schools) can carry a disproportionate amount of weight in determining the outcome. This latter method also has the feature that for this small sample it is very difficult to have statistically significant results unless the differences in mean scores between two groups are enormous (or if the variations among schools within a group are very small). Since each of the two methods has drawbacks, I have opted to present the results from both types of analysis. In the interest of uniformity all scores are reported as percentages, rather than raw scores, as different tests had different numbers of items.

Another problem with the analysis is that background data on students and teachers is not generally available. The test administrators were not very conscientious about collecting data or else the teachers do not have these data at hand. In many cases teacher names are missing and I am not even sure if the results from a particular school are from one class or several. In the case of student data we tried to obtain information about the student's sex and age, and also whether that student attended preschool and whether he has repeated the grade, as well as the student's attendance record for the year. However, except for the case of sex, which was reconstructed in most cases from the student's name, the data are insufficient to permit reliable futher analysis. The problem of large numbers of missing cases is aggravated by the fact that these usually include all of the students from particular schools, and do not constitute a random sample of students from all schools. Thus, I have limited reporting of results to a few results

in which student age is taken into consideration. Even these results are not reliable and are meant only to attempt to indicate general trends.

GRADE 1 ENGLISH POSTTEST

As we can see from Table E1-1 the test was given to 579 students from 15 schools. About 60% of the students were boys; the average age was 11.5 years. Although there were the same number of schools in each group the IEL group had the greatest number of students. This same phenomenon holds in all of the tests and is mainly due to the disproportionately large number of students in the Dorothy Cooper school. The number of students in each school is shown in Table E1-5. Table E1-1 also shows that the IEL and OC groups were evenly matched for sex and age, but the SQ schools had more boys and their students were older on the average. Once again, it must be emphasized that information about student age is very incomplete and may be unreliable. Very little information was available on students taking this test with respect to repetition, preschool and attendance and is not reported here.

In Table E1-2 we see the results, divided according to sex as well as the total results, of the Grade 1 English posttest. The OC group scored much higher than the IEL and SQ groups as we can see in the third part of the table. There was virtually no difference between IEL and SQ on this test. Table E1-2 statistics are calculated with the student as the unit of analysis, that is, e.g., the 46.2% reported as the mean score for IEL is the simple average of all 242 student scores. We notice that in all 3 groups the boys scored somewhat higher than girls. Table E1-3 shows results for 3 age groups. In general, the older students scored higher than the younger students up to the age of 12 and after that there was a slight drop.

Table E1-4 presents results by using the school as the unit of analysis. In other words, the mean score of 43.3% reported for the IEL group in this table is the average of the 5 school average scores, with equal weight given to each school regardless of the size of the school. Once again the OC group scores highest, but the difference is much smaller than in Table E1-1.

Table E1-5 shows the results for each school. As we can see, there is indeed a large variation among the different schools. As will be the case on almost all of the tests the David Fejue (OC) school scored much higher than any other school, which accounts for much of the advantage that the OC group has in most of the tests. Results are given in order of score from highest to lowest.

Figures E1-1 to E1-4 show the distribution of individual student scores for the total set of schools as well as for each group of schools. Scores are grouped so that the code 0 represents the scores less than 10%, 10 represents the scores from 10-19%, and so on with 90 representing those scores from 90-100. The numbers in parentheses are the numbers of students scoring in that range. The scores for the Grade 1 English test approximate a normal distribution with most students scoring from 30-70%. The mean score on the entire test was 51.2%. This was the objective in designing all of the tests, as a medium level of difficulty generally permits the maximum amount of discrimination in scores among groups. The distribution for IEL and SQ are very similar, whereas the OC scores have an unusually large number of scores in the 90-100 range, largely due to scores from David Fejue school.

In conclusion, it is clear that the OC group performed best on the Grade 1 English posttest regardless of how the results are analyzed. There was essentially no difference between IEL and SQ results.

Table E1-1

Grade 1 English Posttest Population

	No. of schools	No. of studs.	% boys(1)	Mean(2) age
IEL	5	242	60.4	11.3
OC	5	187	59.0	11.3
SQ	5	150	68.5	12.1
Overall	15	579	62.1	11.5

Notes: (1) 12 missing cases
(2) 215 missing cases

Table E1-2

Results of Grade 1 English Posttest

	Boys		Girls		Total	
	Mean % correct	SD	Mean% correct	SD	Mean% correct	SD
IEL	48.5	19.3	44.4	17.6	46.2	19.0
OC	67.6	27.6	56.1	25.1	63.0	27.0
SQ	45.9	14.9	39.5	19.6	44.0	16.8
Overall	53.6	23.1	47.4	21.8	51.2	22.8

Notes: The range of student scores is from 0 to 100.
Difference between OC and IEL is significant at $p<.001$ with $t=7.55$.
Difference between OC and SQ is significant at $p<.001$ with $t=7.53$.

Table E1-3

Grade 1 English Results by Age Group

	Age 7-9			Age 10-12			Age 13-18		
	No. of studs.	Mean% correct	SD	No. of studs.	Mean% correct	SD	No. of studs.	Mean% correct	SD
IEL	15	37.5	16.9	125	50.6	19.8	34	46.3	13.4
OC	13	42.9	21.7	48	48.4	18.2	21	48.0	19.2
SQ	18	29.4	15.0	43	39.3	15.0	47	43.0	15.0
Overall	46	35.8	18.2	216	47.9	19.0	102	45.1	15.4

Table E1-4

Grade 1 English Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	43.3	5.7
OC	5	50.6	25.6
SQ	5	45.0	9.6
Overall	15	46.3	15.3

Note: None of these differences is significant at the $p<.05$ level.

Table E1-5

Grade 1 English Results by School

School	Group	No. of students	Mean% correct	SD
David Fejue	OC	70	91.6	10.7
Martha Tubman	SQ	41	56.4	13.3
EJ Yancy	OC	66	53.7	12.4
Mamadee	SQ	9	53.1	13.1
Dorothy Cooper	IEL	118	52.6	21.2
SS Collins	IEL	17	43.9	12.6
Gbelenah	SQ	33	43.64	19.1
Yanniquelle	OC	15	43.56	17.5
Ganglota	OC	19	41.9	11.6
JS Milton	IEL	19	41.5	14.0
Frelela	IEL	42	40.8	13.7
Gorlu	SQ	26	37.6	9.3
Gorpu Dolo Boi	IEL	46	37.4	15.3
Nyofarkollie	SQ	41	34.0	13.6
Corporal Woah	OC	17	22.1	18.6

Figure E1-1

Grade 1 English Posttest Distribution of Scores

```
code
      I
  0.  **** (     11)
      I
      I
      I
 10.  ******** (     28)
      I
      I
      I
 20.  ************** (     51)
      I
      I
      I
 30.  ************************** (    101)
      I
      I
      I
 40.  ********************************** (    129)
      I
      I
      I
 50.  ****************** (     68)
      I
      I
      I
 60.  ******************** (     79)
      I
      I
      I
 70.  ********** (     36)
      I
      I
      I
 80.  ****** (     20)
      I
      I
      I
 90.  ************** (     56)
      I
      I
      I.........I.........I.........I.........I.........I
      0         40        80        120       160       200
      frequency
```

Figure E1-2

Grade 1 English Posttest Distribution of IEL Scores

```
code
      I
  0.  *** (      3)
      I
      I
      I
 10.  ********* (     15)
      I
      I
      I
 20.  ************** (     26)
      I
      I
      I
 30.  ************************** (     47)
      I
      I
      I
 40.  ********************************** (     63)
      I
      I
      I
 50.  ************** (     26)
      I
      I
      I
 60.  ****************** (     33)
      I
      I
      I
 70.  ********** (     20)
      I
      I
      I
 80.  *** (      4)
      I
      I
      I
 90.  **** (      5)
      I
      I
      I.........I.........I.........I.........I.........I
      0         20        40        60        80       100
      frequency
```

Figure E1-3

Grade 1 English Posttest Distribution of OC Scores

```
code
      I
  0.  **** (      5)
      I
      I
      I
 10.  **** (      5)
      I
      I
      I
 20.  ****** (      9)
      I
      I
      I
 30.  ********** (     20)
      I
      I
      I
 40.  ************** (     28)
      I
      I
      I
 50.  ********** (     20)
      I
      I
      I
 60.  ************** (     28)
      I
      I
      I
 70.  ***** (      8)
      I
      I
      I
 80.  ******** (     13)
      I
      I
      I
 90.  ************************** (     51)
      I
      I
      I.........I.........I.........I.........I.........I
      0         20        40        60        80       100
      frequency
```

Figure E1-4

Grade 1 English Posttest Distribution of SQ Scores

```
NEWPER

code
      I
   0. **** (      3)
      I
      I
      I
  10. ********* (      8)
      I
      I
      I
  20. ***************** (     16)
      I
      I
      I
  30. ************************************ (     34)
      I
      I
      I
  40. ****************************************** (     38)
      I
      I
      I
  50. ************************ (     22)
      I
      I
      I
  60. ******************* (     18)
      I
      I
      I
  70. ********* (      8)
      I
      I
      I
  80. **** (      3)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

GRADE 1 MATHEMATICS POSTTEST

The first-grade mathematics posttest was given to 601 students in 15 schools. Since the tests for the same grade are generally given on separate days we do not expect the student population to be exactly the same for each test, so we describe each population separately although there is presumably a large overlap among tests in the same grade. We see once again that there are more IEL students and that the SQ schools have proportionately more boys in first grade. IEL students are a little younger than OC students who are slightly younger than SQ students. The average age for all students, 11.4 years, is almost the same as for the students taking the English posttest. On this test we have more data on students. We see that (based on 214 students) about one fourth are repeaters, with fewer repeaters in the OC group. More than 90% of the students have attended preschool. The average number of days missed is 6.6 with IEL and OC students missing fewer days than SQ students.

Results of the test by student are summarized in Table M1-2. The OC and SQ groups score about the same with the IEL group scoring somewhat lower. In all 3 groups boys scored much higher than girls. Table M1-3 shows that, in general, older students scored higher than younger students.

If we look at Table M1-4 we see that using the second type of analysis narrows the gaps among the mean scores of the 3 groups. With this type of analysis the SQ group scores higher than the IEL and OC groups which score about the same. Table M1-5 shows results for each school. There is a gradual transition down to the last two schools, Dorothy Cooper (IEL) and Corporal Woah (OC), which score considerably lower.

Figures M1-1 to M1-4 give student score distributions. It is clear that this test, which covers the curriculum, is too easy from the point of view of group discrimination. There are too many scores in the 90's in all 3 groups, producing a ceiling effect.

It is not clear as to whether the OC or SQ group performed the best on the first-grade mathematics test, but there is little doubt that the IEL group performed worse than the other two groups.

Table M1-1

Grade 1 Mathematics Posttest Population

	No. of schools	No. of studs.	% boys(1)	Mean(2) age	% Repeat (3)	% Presch. (4)	Mean(5) absent
IEL	5	268	58.5	11.0	27.8	94.9	6.3
OC	5	184	58.4	11.8	14.0	94.7	5.6
SQ	5	149	70.8	12.1	28.4	90.0	9.4
Overall	15	601	61.5	11.4	24.3	94.1	6.6

Notes: (1) 38 missing cases
(2) 272 missing cases
(3) 387 missing cases
(4) 348 missing cases
(5) 375 missing cases

Table M1-2

Grade 1 Mathematics Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	74.8	23.5	59.5	27.7	68.4	26.1
OC	82.3	20.0	75.3	22.0	79.1	21.2
SQ	84.5	14.3	66.6	23.3	78.5	19.7
Overall	79.7	20.6	66.0	26.0	74.2	23.7

Notes: Student scores range from 0 to 100.
The difference between OC and IEL is significant at the $p<.001$ level with $t=4.64$.
The difference between SQ and IEL is significant at the $p<.001$ level with $t=4.12$.

Table M1-3

Grade 1 Mathematics Results by Age Group

	Age 7-10		Age 11-12		Age 13-20	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean% corr.
IEL	93	59.2	73	66.9	36	79.4
OC	28	83.5	22	85.8	36	80.8
SQ	6	75.8	19	80.6	16	81.5
Overall	127	65.3	114	72.8	88	80.4

Table M1-4

Grade 1 Mathematics Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	72.8	6.0
OC	5	73.3	15.1
SQ	5	78.1	5.4
Overall	15	74.7	9.5

Note: None of these differences is significant at the .05 level.

Table M1-5

Grade 1 Mathematics Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	67	88.9	10.9
Martha Tubman	SQ	41	85.0	15.1
Gbelenah	SQ	35	81.8	17.7
EJ Yancy	OC	66	79.1	16.7
Ganglota	OC	19	77.08	24.6
Mamadee	SQ	9	77.06	20.7
SS Collins	IEL	18	76.5	18.2
Gorpu Dolo Boi	IEL	46	76.0	25.9
Gorlu	SQ	24	75.94	16.6
Frelela	IEL	40	75.88	17.7
JS Milton	IEL	19	73.3	21.8
Yanniquelle	OC	15	73.1	23.4
Nyofarkollie	SQ	40	70.9	24.5
Dorothy Cooper	IEL	145	62.2	28.1
Corporal Woah	OC	17	48.4	30.0

Figure M1-1

Grade 1 Mathematics Posttest Distribution of Scores

```
code
     I
  0. ** (     11)
     I
     I
     I
 10. ** (     13)
     I
     I
     I
 20. *** (     19)
     I
     I
     I
 30. **** (     29)
     I
     I
     I
 40. **** (     30)
     I
     I
     I
 50. **** (     31)
     I
     I
     I
 60. ******* (     59)
     I
     I
     I
 70. ********** (     87)
     I
     I
     I
 80. ************* (    120)
     I
     I
     I
 90. ********************* (    202)
     I
     I
     I.........I.........I.........I.........I.........I
     0        100       200       300       400       500
     frequency
```

Figure M1-2

Grade 1 Mathematics Posttest Distribution of IEL Scores

```
code
      I
  0.  ****** (      9)
      I
      I
      I
 10.  ****** (      9)
      I
      I
      I
 20.  ******* (     12)
      I
      I
      I
 30.  ********* (     16)
      I
      I
      I
 40.  ********** (     17)
      I
      I
      I
 50.  ********* (     16)
      I
      I
      I
 60.  ****************** (     34)
      I
      I
      I
 70.  ********************* (     40)
      I
      I
      I
 80.  ************************* (     47)
      I
      I
      I
 90.  ************************************ (     68)
      I
      I
      I.........I.........I.........I.........I.........I
      0         20        40        60        80       100
      frequency
```

Figure M1-3

Grade 1 Mathematics Posttest Distribution of OC Scores

```
code
      I
   0. ** (      2)
      I
      I
      I
  10. *** (      3)
      I
      I
      I
  20. *** (      3)
      I
      I
      I
  30. ***** (      7)
      I
      I
      I
  40. **** (      6)
      I
      I
      I
  50. ***** (      8)
      I
      I
      I
  60. ********* (     16)
      I
      I
      I
  70. ************ (     23)
      I
      I
      I
  80. ******************* (     36)
      I
      I
      I
  90. ****************************************** (     80)
      I
      I
      I.........I.........I.........I.........I.........I
      0         20        40        60        80       100
      frequency
```

Figure M1-4
Distribution of SQ Scores on Grade 1 Math Posttest

```
code
     I
 10. ** (      1)
     I
     I
     I
 20. *** (      4)
     I
     I
     I
 30. **** (      6)
     I
     I
     I
 40. ***** (      7)
     I
     I
     I
 50. ***** (      7)
     I
     I
     I
 60. ****** (      9)
     I
     I
     I
 70. ************* (     24)
     I
     I
     I
 80. ******************** (     37)
     I
     I
     I
 90. ***************************** (     54)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

GRADE 2 ENGLISH POSTTEST

Table E2-1 describes the population of students taking the second-grade English posttest. There were 484 students taking this test and 450 taking the second-grade mathematics test, which represents about a 20% drop from the numbers of first-grade students. The wrong test booklets were used at Martha Tubman (SQ) school, so we only have results from 14 schools. The percentage of boys is up to about 66% from about 62% in first grade. The IEL and SQ groups had about the same percentage of boys with OC having a larger proportion. The mean age is 13 years, or about 1 1/2 years higher than in first grade. IEL students were the oldest on the average and SQ the youngest. Not enough repeater, preschool and attendance data are available to bother reporting.

In Table E2-2 we see that there were large differences in scores among all 3 groups ranging from OC to IEL to SQ. In general, boys scored somewhat higher than girls in all groups. Table E2-3 shows in general that older students did better than younger students.

Table E2-4 gives results with the school as the unit of analysis. The order of the results is still the same, but the IEL group has moved closer to the OC group. The school results show the very high results at the David Fejue school (86%). For the other schools there is a relatively gradual transition from 60% to 30%.

In Figures E2-1 to E2-4 we can see the distribution of scores for the second-grade English test. The general distribution is fairly normal with the greatest number scoring in the 40's (mean score is 49.3). The IEL

distribution is similar, while the OC distribution is similar except for a larger number in the 80's and 90's. The SQ distribution is normal looking but peaks in the 30's, which is somewhat lower.

In general, it appears on this test that the OC group scored highest with IEL not too much lower and the SQ group doing considerably worse than the other two groups.

Table E2-1

Grade 2 English Posttest Population

	No. of schools	No. of students	% boys(2)	Mean(3) age
IEL	5	254	64.7	13.3
OC	5	138	70.6	12.9
SQ	4(1)	92	63.7	12.4
Overall	14	484	66.2	13.0

Notes: (1) The wrong test booklets were used at Martha Tubman.
(2) 8 missing cases
(3) 188 missing cases

Table E2-2

Grade 2 English Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	50.5	15.0	45.2	14.4	48.9	14.9
OC	58.2	24.3	57.7	27.9	58.2	25.3
SQ	40.3	13.2	32.4	19.2	37.3	15.9
Overall	51.0	19.0	45.7	21.2	49.3	19.9

Notes: (1) The student scores range from 2.2 to 97.8.
(2) All 3 differences in means in the total column are significant at the .001 level.

Table E2-3

Grade 2 English Results by Age Groups

	Age 7-11		Age 12-14		Age 15-20	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean % correct
IEL	22	43.0	89	49.5	37	52.9
OC	17	48.0	42	55.0	14	51.9
SQ	29	38.9	32	35.3	14	38.3
Overall	68	42.5	163	48.1	65	49.5

Table E2-4

Grade 2 English Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	50.8	8.6
OC	5	52.4	21.5
SQ	4	37.2	2.8
Overall	14	47.5	14.6

Note: The difference between IEL and SQ is significant at the .05 level with t=3.00.

Table E2-5

Grade 2 English Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	49	86.3	11.0
Gorpu Dolo Boi	IEL	46	59.2	13.7
JS Milton	IEL	27	58.4	14.8
Yanniquelle	OC	10	54.0	11.5
EJ Yancy	OC	29	53.9	7.9
SS Collins	IEL	25	52.3	15.3
Dorothy Cooper	IEL	129	44.4	12.1
Gorlu	SQ	21	40.8	10.4
Frelela	IEL	27	39.8	14.3
Gbelenah	SQ	17	37.6	10.7
Corporal Woah	OC	24	37.1	16.9
Nyofarkollie	SQ	44	36.3	19.7
Mamadee	SQ	10	34.2	15.0
Ganglota	OC	26	30.9	11.2

Figure E2-1

Grade 2 English Posttest Distribution of Scores

```
code
      I
  0.  ** (      4)
      I
      I
      I
 10.  ****** (     20)
      I
      I
      I
 20.  ************** (     51)
      I
      I
      I
 30.  ********************** (     89)
      I
      I
      I
 40.  ************************ (    101)
      I
      I
      I
 50.  ********************* (     79)
      I
      I
      I
 60.  ***************** (     69)
      I
      I
      I
 70.  ******* (     22)
      I
      I
      I
 80.  ******** (     26)
      I
      I
      I
 90.  ******* (     20)
      I
      I
      I.........I.........I.........I.........I.........I
      0         40        80        120       160       200
      frequency
```

Figure E2-2

Grade 2 English Posttest Distribution of IEL Scores

```
code
      I
   0. ** (      1)
      I
      I
      I
  10. ** (      2)
      I
      I
      I
  20. ************* (     24)
      I
      I
      I
  30. ************************** (     49)
      I
      I
      I
  40. ****************************** (     57)
      I
      I
      I
  50. ************************** (     49)
      I
      I
      I
  60. ************************** (     51)
      I
      I
      I
  70. ********* (     15)
      I
      I
      I
  80. **** (      6)
      I
      I
      I.........I.........I.........I.........I.........I
      0         20        40        60        80       100
      frequency
```

Figure E2-3

Grade 2 English Posttest Distribution of OC Scores

```
code
     I
 10. ********* (      8)
     I
     I
     I
 20. ************** (     13)
     I
     I
     I
 30. **************** (     15)
     I
     I
     I
 40. ***************************** (     25)
     I
     I
     I
 50. ***************** (     16)
     I
     I
     I
 60. *************** (     14)
     I
     I
     I
 70. ****** (      5)
     I
     I
     I
 80. ******************** (     19)
     I
     I
     I
 90. ************************ (     23)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure E2-4

Grade 2 English Posttest Distribution of SQ Scores

```
code
      I
   0. **** (      3)
      I
      I
      I
  10. ********** (     10)
      I
      I
      I
  20. *************** (     14)
      I
      I
      I
  30. ************************** (     25)
      I
      I
      I
  40. ******************* (     19)
      I
      I
      I
  50. *************** (     14)
      I
      I
      I
  60. ***** (      4)
      I
      I
      I
  70. *** (      2)
      I
      I
      I
  80. ** (      1)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency

VALID CASES       92       MISSING CASES      0
```

GRADE 2 MATHEMATICS POSTTEST

This test was taken by 450 students in 15 schools. About 64% of the students were boys. as shown in Table M2-1. IEL had a smaller proportion of boys than SQ which had a smaller proportion than OC. The average age was 12.9 years with IEL students somewhat younger than the OC and SQ students.

The results in Table M2-2 indicate that once again the OC group scored highest with IEL second and SQ lowest. However, a glance at Table M2-4 shows that if we use the school as the unit of analysis then IEL is first and OC second, leading us to classify the results of this test as inconclusive. Once again, as seems generally to be the case in mathematics. the boys outperformed the girls in every group. Table M2-3 indicates that older students generally score higher than younger students at this level of mathematics. Table M2-5 shows a gradual transition of school average scores from about 72% to 35%.

Figures M2-1 to M2-4 show that the distribution of scores is generally bimodal on this test with peaks in the 40's and 60's. The exception is the OC group which shows no really low scores and has a normal distribution from 20-100 with a peak in the 60's.

The results of this test do not permit us to conclude whether IEL or OC students did best, but definitely indicate that the SQ group scored lower than the other two groups.

Table M2-1

Grade 2 Mathematics Posttest Population

	No. of school	No. of studs.	% boys(1)	Mean(2) age
IEL	5	217	60.5	12.6
OC	5	128	68.8	13.3
SQ	5	105	64.6	13.4
Overall	15	450	63.8	12.9

Notes: (1) 19 missing cases
(2) 267 missing cases

Table M2-2

Grade 2 Mathematics Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	60.4	16.7	48.6	15.5	55.9	17.2
OC	61.4	18.7	59.4	19.1	60.5	18.7
SQ	57.0	17.3	44.4	18.4	51.6	19.3
Overall	59.9	17.5	50.4	17.9	56.2	18.4

Notes: Student scores range from 4.4 to 95.6.
The difference between OC and IEL is significant at the .05 level with t=2.32.
The difference between OC and SQ is significant at the .001 level with t=3.57.
The difference between IEL and SQ is significant at the .05 level with t=2.04.

Table M2-3

Grade 2 Mathematics Results by Age Groups

	Age 7-11		Age 12-14		Age 15-22	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean % corr.
IEL	33	48.1	69	52.8	14	56.5
OC	11	48.7	33	60.0	13	57.1
SQ	3	59.3	3	43.0	4	58.9
Overall	47	49.0	105	54.8	31	57.1

Table M2-4

Grade 2 Mathematics Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	59.2	10.9
OC	5	55.6	12.6
SQ	5	51.2	11.2
Overall	15	55.3	11.2

Note: None of these differences is significant at the .05 level.

Table M2-5

Grade 2 Mathematics Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	48	71.9	16.1
JS Milton	IEL	27	70.4	12.4
Gorpu Dolo Boi	IEL	30	69.5	14.6
EJ Yancy	OC	29	65.7	13.2
Martha Tubman	SQ	24	65.4	11.3
SS Collins	IEL	24	59.3	14.4
Gbelenah	SQ	16	55.0	16.5
Mamadee	SQ	10	54.2	17.4
Corporal W ah	OC	14	51.6	17.4
Dorothy Cooper	IEL	110	50.3	15.3
Frelela	IEL	27	46.3	15.5
Nyofarkollie	SQ	44	46.0	20.9
Ganglota	OC	27	45.7	13.5
Yanniquelle	OC	10	43.3	12.9
Gorlu	SQ	10	35.3	10.2

Figure M2-1

Grade 2 Mathematics Posttest Distribution of Scores

```
code
     I
  0. *** (      4)
     I
     I
     I
 10. *** (      4)
     I
     I
     I
 20. ***************** (     31)
     I
     I
     I
 30. ************************ (     41)
     I
     I
     I
 40. ******************************************** (     93)
     I
     I
     I
 50. ************************************ (     67)
     I
     I
     I
 60. ************************************************** (    100)
     I
     I
     I
 70. ***************************** (     60)
     I
     I
     I
 80. ********************* (     40)
     I
     I
     I
 90. ****** (     10)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure M2-2

Grade 2 Mathematics Posttest Distribution of IEL Scores

```
code
     I
 10. **** (      3)
     I
     I
     I
 20. *********** (     10)
     I
     I
     I
 30. ************************ (     24)
     I
     I
     I
 40. ************************************************ (     50)
     I
     I
     I
 50. ********************************** (     35)
     I
     I
     I
 60. ************************************************ (     49)
     I
     I
     I
 70. ************************ (     23)
     I
     I
     I
 80. ********************** (     22)
     I
     I
     I
 90. *** (      2)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure M2-3

Grade 2 Mathematics Posttest Distribution of OC Scores

```
code
      I
 20.  ********* (      8)
      I
      I
      I
 30.  ************ (     11)
      I
      I
      I
 40.  ********************** (     20)
      I
      I
      I
 50.  ******************** (     18)
      I
      I
      I
 60.  ********************************** (     30)
      I
      I
      I
 70.  ********************** (     20)
      I
      I
      I
 80.  ************** (     13)
      I
      I
      I
 90.  ********* (      8)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

Figure M2-4

Grade 2 Mathematics Posttest Distribution of SQ Scores

```
code
     I
  0. ***** (      4)
     I
     I
     I
 10. ** (      1)
     I
     I
     I
 20. ************** (     12)
     I
     I
     I
 30. ******* (      6)
     I
     I
     I
 40. ************************ (     23)
     I
     I
     I
 50. *************** (     14)
     I
     I
     I
 60. ********************** (     21)
     I
     I
     I
 70. ****************** (     17)
     I
     I
     I
 80. ****** (      5)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

GRADE 3 ENGLISH POSTTEST

Table E3-1 describes the population of 382 students taking the Grade 3 English posttest. This number again represents a drop of about 20% from the number of students present in the second grade. There is a large jump in the proportion of boys from about 65% in the second grade to about 75% in the third grade. The proportion of boys (68%) in the IEL group is much lower than in the other two groups, in which more than 80% of the students are boys. The mean age of all students in third grade is about 14, which is about a year older than the age in second grade. The repetition rate in third grade, at least for about 210 students, seems to be only about 7%, which is much lower than the 24% reported in our only available first-grade data. The 75% of students with preschool seems to be lower than the 90+ percent in the first grade. However, the large variation indicates that these figures may not be reliable. The number of days absent is slightly higher than in first grade with relatively small differences among the 3 groups.

Table E3-2 shows the results by student. The IEL group scored highest with OC second and SQ third. On the average there is little difference between boys and girls on this test. There is also not much difference, on the average, among the 3 age groups, as seen in Table E3-3.

If we look at the analysis with school as the unit in Table E3-4 we see that these results agree with the results of Table E3-2 with IEL scoring highest and OC next. In the third-grade English test the IEL students definitely performed best. School results vary gradually from 70% to 40%.

Figure E3-1 shows the general distribution of student scores on the third-grade English test. The result is approximately normal with a peak in the 50's (mean score of 57%). The OC curve is similar to the general curve. The IEL curve has a larger number of scores in the 70's and 80's, whereas the SQ curve shows more scores in the 30's and 40's.

Table E3-1

Grade 3 English Posttest Population

	No. of school	No. of studs.	% boys(1)	Mean(2) age	% Repeater (3)	% Presch. (4)	Mean(5) absent
IEL	5	155	68.3	13.4	4.9	95.7	9.4
OC	5	129	81.0	13.3	14.0	35.7	8.8
SQ	5	98	83.5	15.8	3.8	81.1	7.6
Overall	15	382	76.5	14.1	7.1	75.2	8.5

Notes: (1) 25 missing cases
(2) 205 missing cases
(3) 170 missing cases
(4) 180 missing cases
(5) 243 missing cases

Table E3-2

Grade 3 English Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	62.7	17.2	57.2	15.6	60.5	17.1
OC	55.6	18.7	60.2	14.7	55.9	17.9
SQ	53.4	18.1	47.2	13.6	53.0	17.4
Overall	57.6	18.4	56.2	15.5	57.0	17.7

Notes: Student scores range from 12 to 98.
The difference between IEL and OC is significant at the .05 level with t=2.22.
The difference between IEL and SQ is significant at the .001 level with t=3.40.

Table E3-3

Grade 3 English Results by Age Groups

	Age 8-12		Age 13-14		Age 15-20	
	No. of students	Mean % correct	No. of students	Mean % correct	No. of students	Mean % corr.
IEL	19	61.3	28	65.0	18	70.0
OC	19	64.2	30	64.0	10	54.6
SQ	5	47.6	14	49.6	34	48.4
Overall	43	61.0	72	61.6	62	55.7

Table E3-4

Grade 3 English Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	63.5	6.4
OC	5	53.9	6.4
SQ	5	49.9	9.2
Overall	15	55.8	9.1

Notes: The difference between IEL and OC is significant at the .05 level with t=2.38.
The difference between IEL and SQ is significant at the .05 level with t=2.72.

Table E3-5

Grade 3 English Results by School

School	Group	No. of students	Mean % correct	SD
Gorpu Dolo Boi	IEL	18	70.7	13.5
JS Milton	IEL	13	68.8	16.1
EJ Yancy	OC	47	64.8	14.0
Frelela	IEL	29	63.9	17.0
Martha Tubman	SQ	25	62.7	16.3
SS Collins	IEL	16	58.1	18.2
Dorothy Cooper	IEL	79	56.1	16.4
Corporal Woah	OC	12	53.5	17.6
Yanniquelle	OC	18	52.9	11.8
Nyofarkollie	SQ	37	52.4	16.4
Gorlu	SQ	20	52.3	12.0
David Fejue	OC	36	50.1	22.2
Ganglota	OC	16	48.3	13.8
Mamadee	SQ	3	42.7	9.0
Gbelenah	SQ	13	39.4	21.0

Figure E3-1

Grade 3 English Posttest Distribution of Scores

```
code
     I
 10. **** (      5)
     I
     I
     I
 20. ********** (     17)
     I
     I
     I
 30. ********************** (     43)
     I
     I
     I
 40. ********************************** (     66)
     I
     I
     I
 50. ****************************************** (     76)
     I
     I
     I
 60. ************************************** (     71)
     I
     I
     I
 70. ****************************** (     58)
     I
     I
     I
 80. ******************* (     36)
     I
     I
     I
 90. ****** (     10)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure E3-2

Grade 3 English Posttest Distribution of IEI Scores

```
coda
      I
 20.  **** (      3)
      I
      I
      I
 30.  *************** (     14)
      I
      I
      I
 40.  ***************************** (     27)
      I
      I
      I
 50.  ********************************** (     32)
      I
      I
      I
 60.  ************************** (     25)
      I
      I
      I
 70.  ***************************** (     27)
      I
      I
      I
 80.  ********************** (     21)
      I
      I
      I
 90.  ******* (      6)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

Figure E3-3

Grade 3 English Posttest Distribution of OC Scores

```
code
      I
 10.  *** (      2)
      I
      I
      I
 20.  ********** (      8)
      I
      I
      I
 30.  ****************** (     16)
      I
      I
      I
 40.  ************************** (     22)
      I
      I
      I
 50.  ****************************** (     25)
      I
      I
      I
 60.  ****************************** (     25)
      I
      I
      I
 70.  ********************* (     18)
      I
      I
      I
 80.  ********** (      9)
      I
      I
      I
 90.  ***** (      4)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

Figure E3-4

Grade 3 English Posttest Distribution of SQ Scores

```
code
     I
 10. **** (      3)
     I
     I
     I
 20. ******* (      6)
     I
     I
     I
 30. ************** (     13)
     I
     I
     I
 40. ***************** (     17)
     I
     I
     I
 50. ******************* (     19)
     I
     I
     I
 60. ********************** (     21)
     I
     I
     I
 70. ************** (     13)
     I
     I
     I
 80. ******* (      6)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

GRADE 3 MATHEMATICS POSTTEST

Table M3-1 describes the population for this test. Of the 381 students in 15 schools taking this test about 3/4 were boys. In the IEL group the percentage of boys was slightly less than 70%, with about 80% boys in the OC and SQ groups. The average age was about 14 with the OC students apparently slightly older. However, this information is based on a samply of only about 40 students.

The results in Table M3-2 show that the IEL students scored highest and there was no difference between the OC and SQ schools. Table M3-4 confirms these results. Scores by school show that school mean scores range from about 70% to about 30%.

Figure M3-1 indicates that the distribution of scores is fairly normal with "twin peaks" in the 50's and 60's. The IEL scores, shown in Figure M3-2 are shifted slightly to higher ranges while the OC curve is shifted to lower ranges with a peak in the 40's. The SQ curve is normal with a peak in the 50's.

Table M3-1

Grade 3 Mathematics Posttest Population

	No. of school	No. of studs.	% boys(1)	Mean(2) age
IEL	5	151	68.8	13.0
OC	5	131	79.7	14.0
SQ	5	99	80.9	13.3
Overall	15	381	75.6	13.9

Notes: (1) 20 missing cases
(2) 340 missing cases

Table M3-2

Grade 3 Mathematics Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	61.9	17.4	50.3	15.9	58.0	17.7
OC	53.6	17.3	48.8	16.1	51.9	17.5
SQ	53.2	16.1	48.1	13.6	52.3	15.5
Overall	56.5	17.5	49.4	15.4	54.4	17.3

Notes: Student scores range from 12 to 92.
The difference between IEL and OC is significant at the .01 level with t=2.90.
The difference between IEL and SQ is significant at the .01 level with t=2.64.

Table M3-3

Results of Grade 3 Mathematics by School

School	Group	No. of students	Mean % correct	SD
JS Milton	IEL	13	69.1	13.9
Martha Tubman	SQ	25	61.8	12.4
Dorothy Cooper	IEL	75	59.3	16.4
David Fejue	OC	36	58.8	17.5
Gorpu Dolo Boi	IEL	18	56.0	18.5
Frelela	IEL	29	55.7	21.1
Mamadee	SQ	3	55.3	8.1
EJ Yancy	OC	51	54.9	16.8
Corporal Woah	OC	11	52.2	13.5
SS Collins	IEL	16	50.0	16.0
Nyofarkollie	SQ	38	49.7	16.1
Gorlu	SQ	20	48.3	11.5
Yanniquelle	OC	17	47.8	12.2
Gbelenah	SQ	13	46.8	18.9
Ganglota	OC	16	31.3	9.9

Table M3-4

Grade 3 Mathematics Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	58.0	7.0
OC	5	49.0	10.7
SQ	5	52.4	6.2
Overall	15	53.1	8.5

Note: None of these differences is significant at the .05 level.

Figure M3-1

Grade 3 Mathematics Posttest Distribution of Scores

```
code
     I
 10. **** (      6)
     I
     I
     I
 20. ************** (     26)
     I
     I
     I
 30. ********************* (     42)
     I
     I
     I
 40. ************************************ (     69)
     I
     I
     I
 50. ****************************************** (     79)
     I
     I
     I
 60. ****************************************** (     79)
     I
     I
     I
 70. ************************* (     47)
     I
     I
     I
 80. ************** (     27)
     I
     I
     I
 90. **** (      6)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure M3-2

Grade 3 Mathematics Posttest Distribution of IEL Scores

```
code
     I
 10. *** (      2)
     I
     I
     I
 20. ********* (      8)
     I
     I
     I
 30. ************** (     13)
     I
     I
     I
 40. ************************ (     23)
     I
     I
     I
 50. ********************************** (     30)
     I
     I
     I
 60. ************************************** (     33)
     I
     I
     I
 70. ************************ (     22)
     I
     I
     I
 80. ****************** (     15)
     I
     I
     I
 90. ****** (      5)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure M3-3

Grade 3 Mathematics Posttest Distribution of OC Scores

```
code
     I
 10. *** (      2)
     I
     I
     I
 20. ************ (     11)
     I
     I
     I
 30. ******************* (     18)
     I
     I
     I
 40. ********************************** (     29)
     I
     I
     I
 50. ************************** (     22)
     I
     I
     I
 60. ***************************** (     24)
     I
     I
     I
 70. ***************** (     15)
     I
     I
     I
 80. *********** (     10)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure M3-4

Grade 3 Mathematics Posttest Distribution of SQ Scores

```
code
     I
 10. *** (      2)
     I
     I
     I
 20. ******* (      7)
     I
     I
     I
 30. ********** (     11)
     I
     I
     I
 40. ***************** (     17)
     I
     I
     I
 50. ***************************** (     27)
     I
     I
     I
 60. ********************** (     22)
     I
     I
     I
 70. ********** (     10)
     I
     I
     I
 80. *** (      2)
     I
     I
     I
 90. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

GRADE 3 SCIENCE POSTTEST

Table SC3-1 shows that there were 370 students from 14 schools taking the Grade 3 science posttest. WAEC was unable to locate the results from the Mamadee (SQ) school. No student data are available for the students on this test except sex, which shows that about 75% were boys with once again the IEL schools having proportionately fewer boys.

In Table SC3-2 we see the results of the test by student. IEL and OC score virtually the same, with SQ scoring much lower. In all groups the girls scored lower than the boys. Table SC3-4 of results with the school as the unit confirms the results of Table SC3-2. The David Fejue school scored much higher (76%) than any other school, with the rest ranging from 60% to 37%.

Figures SC3-1 to SC3-4 give student score distributions. The overall distribution has a slightly shifted normal looking distribution with a peak in the 40's. The IEL distribution peaks in the 50's and 60's, the OC distribution in the 40's but with more students at the higher end, and the SQ distribution has a low double peak in the 30's and 40's.

On this test, although IEL scored a fraction of a percentage point higher there is virtually no difference between IEL and OC schools. The SQ group scored much lower.

Table SC3-1

Grade 3 Science Posttest Population

	No. of schools	No. of students	% boys(2)
IEL	5	146	68.8
OC	5	132	80.0
SQ	4(1)	92	78.3
Overall	14	370	75.1

Notes: (1) No results are available from the Mamadee school.
(2) 13 missing cases

Table SC3-2

Grade 3 Science Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	57.3	12.3	50.9	12.2	55.2	12.5
OC	55.4	16.0	52.4	17 0	54.8	16.0
SQ	45.2	11.5	36.7	10.3	42.9	11.6
Overall	53.6	14.4	48.5	14.6	52.0	14.6

Notes: Student scores range from 17.5 to 90.
The difference between IEL and SQ is significant at the .001 level with t=7.63.
The difference between OC and SQ is significant at the .001 level with t=6.09.

Table SC3-3

Grade 3 Science Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	36	75.6	7.9
Dorothy Cooper	IEL	73	59.8	11.2
JS Milton	IEL	14	55.0	13.0
Gorpu Dolo Boi	IEL	18	53.2	9.2
Corporal Woah	OC	10	50.0	10.6
Martha Tubman	SQ	26	49.9	11.3
Frelela	IEL	25	49.2	11.9
EJ Yancy	OC	53	48.2	10.8
SS Collins	IEL	16	46.3	13.6
Ganglota	OC	16	45.3	10.3
Gorlu	SQ	20	43.3	10.8
Yanniquelle	OC	17	43.1	7.8
Nyofarkollie	SQ	38	39.1	10.3
Gbelenah	SQ	8	37.2	11.1

Table SC3-4

Grade 3 Science Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	52.7	5.2
OC	5	52.4	13.2
SQ	4	42.4	5.6
Overall	14	49.6	9.6

Note: The difference between IEL and SQ is significant at the .05 level with t=2.85.

Figure SC3-1

Grade 3 Science Posttest Distribution of Scores

```
code
     I
 10. ** (      1)
     I
     I
     I
 20. ********** (     17)
     I
     I
     I
 30. ************************** (     54)
     I
     I
     I
 40. ********************************************** (     92)
     I
     I
     I
 50. ****************************************** (     84)
     I
     I
     I
 60. ************************************** (     72)
     I
     I
     I
 70. ******************* (     38)
     I
     I
     I
 80. ******* (     11)
     I
     I
     I
 90. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure SC3-2

Grade 3 Science Posttest Distribution of IEL Scores

```
coga
     I
 20. ***** (      4)
     I
     I
     I
 30. ************ (     11)
     I
     I
     I
 40. ********************** (     26)
     I
     I
     I
 50. ****************************************** (     41)
     I
     I
     I
 60. ************************************************ (     45)
     I
     I
     I
 70. ******************* (     18)
     I
     I
     I
 80. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SC3-3

Grade 3 Science Posttest Distribution of OC Scores

```
code
     I
 20. ***** (      4)
     I
     I
     I
 30. ****************** (     16)
     I
     I
     I
 40. ************************************************ (     39)
     I
     I
     I
 50. ************************** (     25)
     I
     I
     I
 60. ******************** (     18)
     I
     I
     I
 70. ******************** (     19)
     I
     I
     I
 80. *********** (     10)
     I
     I
     I
 90. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SC3-4

Grade 3 Science Posttest Distribution of SQ Scores

```
code
     I
 10. ** (      1)
     I
     I
     I
 20. ********** (      9)
     I
     I
     I
 30. ***************************** (     27)
     I
     I
     I
 40. ***************************** (     27)
     I
     I
     I
 50. ******************* (     18)
     I
     I
     I
 60. ********** (      9)
     I
     I
     I
 70. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

GRADE 3 SOCIAL STUDIES POSTTEST

Table SS3-1 shows that there were 379 students taking the third-grade social studies posttest. Sex and age distributions are similar to the English and mathematics students for this grade, with fewer boys in the IEL group.

In Table SS3-2 we can see that the OC group scored highest with IEL second on this test, and this result is confirmed, with a smaller gap between the two groups, by Table SS3-4. In both tables the SQ group scored lowest. There was little difference among the various age groups (Table SS3-3). Table SS3-5 gives the results for each school. Although David Fejue is the highest there is not the usual large gap between this school and the others characteristic of many of the other tests. There is a gradual transition of scores from 73% to 40%.

Figures SS3-1 to SS3-4 give the distribution of student scores on the Grade 3 social studies test. The general distribution in Figure SS3-1 as well as the IEL distribution in SS3-2 and the OC distribution in SS3-3 show normal distributions with a peak in the 50's, although the OC group has more students in the 70's and 80's. The SQ distribution is very flat with about the same number of students in the 30's, 40's and 50's.

Table SS3-1

Grade 3 Social Studies Posttest Population

	No. of school	No. of studs.	% boys(1)	Mean(2) age
IEL	5	155	66.4	14.3
OC	5	129	81.0	14.2
SQ	5	95	83.7	15.0
Overall	15	379	75.6	14.4

Notes: (1) 18 missing cases
(2) 272 missing cases

Table SS3-2

Grade 3 Social Studies Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean% correct	SD
IEL	51.7	13.4	47.0	13.5	50.3	13.9
OC	58.4	14.2	52.3	11.8	57.5	13.9
SQ	48.6	12.5	43.3	8.6	47.7	12.7
Overall	53.4	14.0	47.8	12.6	52.1	14.1

Notes: The difference between OC and IEL is significant at the .001 level with t=4.36.
The difference between OC and SQ is significant at the .001 level with t=5.42.
Student scores range from 10.4 to 95.8.

Table SS3-3

Grade 3 Social Studies Results by Age Groups

	Age 11-13		Age 14-15		Age 16-20	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean% corr.
IEL	18	45.9	16	43.4	11	43.2
OC	17	47.2	14	51.2	7	49.4
SQ	4	43.2	12	50.0	8	40.6
Overall	39	46.2	42	47.9	26	44.1

Table SS3-4

Grade 3 Social Studies Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	51.5	10.8
OC	5	54.0	11.0
SQ	5	46.5	3.3
Overall	15	50.7	9.0

Note: None of these differences is significant at the .05 level.

Table SS3-5

Grade 3 Social Studies Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	36	72.7	11.2
JS Milton	IEL	14	69.0	12.8
EJ Yancy	OC	48	55.7	8.5
Martha Tubman	SQ	25	51.7	12.3
Gorpu Dolo Boi	IEL	19	51.6	14.0
Dorothy Cooper	IEL	77	49.9	11.4
Corporal Woah	OC	12	47.9	9.1
Yanniquelle	OC	17	47.2	8.2
Frelela	IEL	29	46.8	14.4
Ganglota	OC	16	46.745	10.4
Nyofarkollie	SQ	39	46.741	14.7
Gorlu	SQ	20	46.4	8.8
Gbelenah	SQ	7	45.2	11.4
Mamadee	SQ	4	42.7	11.0
SS Collins	IEL	16	40.0	9.5

Figure SS3-1

Grade 3 Social Studies Posttest Distribution of Scores

```
code
     I
 10. ** (      2)
     I
     I
     I
 20. ***** (     16)
     I
     I
     I
 30. **************** (     61)
     I
     I
     I
 40. ********************* (     81)
     I
     I
     I
 50. ****************************** (    115)
     I
     I
     I
 60. ***************** (     60)
     I
     I
     I
 70. ******** (     29)
     I
     I
     I
 80. ***** (     14)
     I
     I
     I
 90. * (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         40        80        120       160       200
     frequency
```

Figure SS3-2

Grade 3 Social Studies Posttest Distribution of IEL Scores

```
code
     I
 10. ** (      1)
     I
     I
     I
 20. ********** (      9)
     I
     I
     I
 30. ****************************** (     28)
     I
     I
     I
 40. ********************************** (     33)
     I
     I
     I
 50. ************************************************** (     48)
     I
     I
     I
 60. ************************** (     24)
     I
     I
     I
 70. *********** (     10)
     I
     I
     I
 80. ** (      1)
     I
     I
     I
 90. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SS3-3

Grade 3 Social Studies Posttest Distribution of OC Scores

```
code
     I
 20. ** (      1)
     I
     I
     I
 30. ************ (     11)
     I
     I
     I
 40. ************************** (     25)
     I
     I
     I
 50. ****************************************** (     41)
     I
     I
     I
 60. ************************** (     24)
     I
     I
     I
 70. **************** (     15)
     I
     I
     I
 80. ************* (     12)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SS3-4

Grade 3 Social Studies Post-test Distribution of SQ Scores

```
code
     I
 10. ** (      1)
     I
     I
     I
 20. ******* (      6)
     I
     I
     I
 30. ************************ (     22)
     I
     I
     I
 40. ************************* (     23)
     I
     I
     I
 50. ***************************** (     26)
     I
     I
     I
 60. ************* (     12)
     I
     I
     I
 70. ***** (      4)
     I
     I
     I
 80. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

GRADE 4 ENGLISH POSTTEST

By fourth grade our student population has shrunk to under 300 students in the 15 schools, a drop of about 25% from the third-grade population. The percentage of boys has remained constant, about 75%, relative to third grade. As usual IEL has proportionately fewer boys, but the sample taking the English test for which we have age data is a little older (Table E4-1) than the SQ and OC groups. The average age is about 15.5 or a little more than a year older than the average third-grade student.

Table E4-2 gives the results by student. The OC group scored highest with SQ second and IEL lowest. In general there was little difference between the sexes on this test. Table E4-4 of results with school as unit shows no difference between the OC and IEL group, but the SQ group scored somewhat lower. We would have to say that the results of this test are not very conclusive. There is a wide range of school mean scores (Table E4-3) with David Fejue again scoring much higher (88%) than the other schools which varied from 65% to 29%.

Table E4-1

Grade 4 English Posttest Population

	No. of school	No. of studs.	% boys(1)	Mean(2) age
IEL	5	125	72.0	15.6
OC	5	90	77.5	14.7
SQ	5	71	78.1	15.3
Overall	15	286	75.2	15.5

Notes: (1) 24 missing cases
(2) 194 missing cases

Table E4-2

Grade 4 English Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	47.2	19.0	47.8	17.6	48.3	19.0
OC	56.5	25.4	52.0	25.1	56.6	25.3
SQ	50.7	19.1	54.0	16.1	51.2	18.4
Overall	51.0	21.5	50.3	19.5	50.8	21.0

Notes: Student scores range from 8.3 to 98.3
The difference between OC and IEL is significant at the .01 level with t=2.76.
Missing cases brought up the total scores higher than the scores for either sex.

Table E4-3

Grade 4 English Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	28	87.7	8.1
Martha Tubman	SQ	26	65.4	10.9
JS Milton	IEL	13	62.8	16.5
Mamadee	SQ	4	62.1	9.6
Frelela	IEL	23	58.2	14.8
Yanniquelle	OC	6	53.9	12.9
Gorpu Dolo Boi	IEL	14	53.0	14.1
SS Collins	IEL	20	47.3	18.8
Corporal Woah	OC	4	46.3	16.9
Gorlu	SQ	12	45.3	13.3
EJ Yancy	OC	39	44.7	15.8
Nyofarkollie	SQ	22	42.7	16.4
Dorothy Cooper	IEL	55	39.9	18.5
Ganglota	OC	13	30.0	12.3
Gbelenah	SQ	7	29.0	16.7

Table E4-4

Grade 4 English Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	52.2	9.0
OC	5	52.5	21.5
SQ	5	48.9	14.9
Overall	15	51.2	14.9

Note: None of these differences is significant at the .05 level.

Figure E4-1

Grade 4 English Posttest Distribution of Scores

```
code
     I
  0. ** (      1)
     I
     I
     I
 10. ************* (     12)
     I
     I
     I
 20. ********************************** (     32)
     I
     I
     I
 30. ********************************************** (     46)
     I
     I
     I
 40. ***************************************************** (     49)
     I
     I
     I
 50. ************************************************** (     47)
     I
     I
     I
 60. ******************************** (     31)
     I



     I
     I
 70. ************************************ (     34)
     I
     I
     I
 80. ***************** (     16)
     I
     I
     I
 90. ******************* (     18)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure E4-2

Grade 4 English Posttest Distribution of IEL Scores

```
code
     I
 10. ***** (      4)
     I
     I
     I
 20. ******************** (     19)
     I
     I
     I
 30. ********************** (     21)
     I
     I
     I
 40. ************************ (     22)
     I
     I
     I
 50. ***************************** (     25)
     I
     I
     I
 60. *************** (     14)
     I
     I
     I
 70. *********** (     10)
     I



     I
     I
 80. ******** (      7)
     I
     I
     I
 90. **** (      3)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure E4-3

Grade 4 English Posttest Distribution of OC Scores

```
code
     I
 10. *********** (      4)
     I
     I
     I
 20. ********************** (      8)
     I
     I
     I
 30. ************************************** (     14)
     I
     I
     I
 40. ******************************************** (     16)
     I
     I
     I
 50. ************************** (     10)
     I
     I
     I
 60. ************** (      5)
     I
     I
     I
 70. ****************************** (     11)
     I



     I
     I
 80. ******************* (      7)
     I
     I
     I
 90. ***************************************** (     15)
     I
     I
     I.........I.........I.........I.........I.........I
     0         4         8        12        16        20
     frequency
```

Figure E4-4

Grade 4 English Posttest Distribution of SQ Scores

```
code
     I
  0. **** (      1)
     I
     I
     I
 10. *********** (      4)
     I
     I
     I
 20. ************** (     5)
     I
     I
     I
 30. ***************************** (     11)
     I
     I
     I
 40. ***************************** (     11)
     I
     I
     I
 50. ******************************** (     12)
     I
     I
     I
 60. ******************************** (     12)
     I



     I
     I
 70. ********************************** (     13)
     I
     I
     I
 80. ****** (      2)
     I
     I
     I.........I.........I.........I.........I.........I
     0         4         8        12        16        20
     frequency
```

GRADE 4 MATHEMATICS POSTTEST

Table M4-1 describes the population for the fourth-grade mathematics posttest. There were 287 students from 14 schools. WAEC could not locate the results for the Ganglota (OC) school. As usual there were proportionately fewer boys in the IEL group. Age data from only about 1/3 of the students show that the average SQ student is 18 years old, but a quick check show that this is not in agreement with results of the other fourth-grade tests and is probably due to a biased small sample.

Table M4-2 shows that the OC group scored somewhat higher than the SQ group and both scored much higher than the IEL group. The results are confirmed by Table M4-4 in which the advantage of the OC group is even larger. Table M4-2 also shows that boys scored much higher than girls on this test. The results by age group in Table M4-3 are erratic, which may be due to the size of the sample. Table M4-5 shows that again the David Fejue school scored much higher (84%), with other schools ranging from 68% to 33%.

Table M4-1

Grade 4 Mathematics Posttest Population

	No. of schools	No. of studs.	% boys(2)	Mean(3) age
IEL	5	125	73.6	15.4
OC	4(1)	90	77.0	14.9
SQ	5	72	77.5	18.4
Overall	14	287	75.6	15.9

Notes: (1) No results are available from the Ganglota school.
(2) 4 missing cases
(3) 173 missing cases

Table M4-2

Grade 4 Mathematics Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	41.7	16.7	36.7	11.8	40.4	15.7
OC	61.0	22.2	54.0	21.6	59.4	21.9
SQ	58.7	19.3	45.6	17.5	55.4	19.5
Overall	52.1	21.2	43.8	17.9	50.1	20.6

Notes: Student scores range from 10 to 94.
The difference between OC and IEL is significant at the .001 level with t=7.43.
The difference between SQ and IEL is significant at the .001 level with t=5.92.

Table M4-3

Grade 4 Mathematics Results by Age Groups

	Age 10-13		Age 14-16		Age 17-24	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean% corr.
IEL	13	27.4	24	35.1	18	32.7
OC	9	85.3	18	79.1	7	75.4
SQ	4	53.5	1	42.0	20	44.1
Overall	26	51.5	43	53.7	45	44.4

Table M4-4

Grade 4 Mathematics Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	44.1	6.7
OC	4	61.8	16.1
SQ	5	52.5	13.0
Overall	14	52.2	13.4

Note: None of these differences is significant at the .05 level.

Table M4-5

Grade 4 Mathematics Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	28	84.2	6.0
Martha Tubman	SQ	27	68.0	11.7
Yanniquelle	OC	6	60.3	20.3
Gorlu	SQ	12	58.3	20.6
Mamadee	SQ	4	57.0	18.5
Corporal Woah	OC	4	56.5	18.4
JS Milton	IEL	13	48.5	12.4
Gorpu Dolo Boi	IEL	14	48.3	18.7
SS Collins	IEL	20	46.3	12.8
EJ Yancy	OC	52	46.2	15.5
Frelela	IEL	23	44.9	16.1
Nyofarkollie	SQ	22	44.8	18.3
Gbelenah	SQ	7	34.6	12.5
Dorothy Cooper	IEL	55	32.5	12.8

Figure M4-1

Grade 4 Mathematics Posttest Distribution of Scores

```
code
     I
 10. ****** (     10)
     I
     I
     I
 20. ********************** (     39)
     I
     I
     I
 30. ****************************** (     54)
     I
     I
     I
 40. ****************************** (     52)
     I
     I
     I
 50. ******************** (     35)
     I
     I
     I
 60. ******************* (     34)
     I
     I
     I
 70. *************** (     28)
     I
     I
     I
 80. *************** (     27)
     I
     I
     I
 90. ***** (      8)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure M4-2

Grade 4 Mathematics Posttest Distribution of IEL Scores

```
code
     I
 10. ******** (      7)
     I
     I
     I
 20. ****************************** (     28)
     I
     I
     I
 30. ******************************** (     30)
     I
     I
     I
 40. ****************************** (     29)
     I
     I
     I
 50. ************** (     13)
     I
     I
     I
 60. ********** (      9)
     I
     I
     I
 70. ********** (      9)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure M4-3

Grade 4 Mathematics Posttest Distribution of OC Scores

```
code
     I
 10. **** (      1)
     I
     I
     I
 20. ******I********* (      6)
     I
     I
     I
 30. ********************************** (     14)
     I
     I
     I
 40. ********************************** (     13)
     I
     I
     I
 50. ***************************** (     12)
     I
     I
     I
 60. ************************ (      9)
     I
     I
     I
 70. ************************** (     10)
     I
     I
     I
 80. ********************************************** (     18)
     I
     I
     I
 90. ******************* (      7)
     I
     I
     I.........I.........I.........I.........I.........I
     0         4         8        12        16        20
     frequency
```

Figure M4-4

Grade 4 Mathematics Posttest Distribution of SQ Scores

```
code
     I
 10. ****** (      2)
     I
     I
     I
 20. ************** (      5)
     I
     I
     I
 30. ************************** (     10)
     I
     I
     I
 40. ************************** (     10)
     I
     I
     I
 50. ************************** (     10)
     I
     I
     I
 60. ****************************************** (     16)
     I
     I
     I
 70. ************************ (      9)
     I
     I
     I
 80. ************************ (      9)
     I
     I
     I
 90. **** (      1)
     I
     I
     I.........I.........I.........I.........I.........I
     0         4         8        12        16        20
     frequency
```

GRADE 4 SCIENCE POSTTEST

Table SC4-1 shows that there were 288 students in 15 schools taking the fourth-grade science posttest. The IEL schools had relatively fewer boys, and their students were older on the average. Other data are scarce and results are somewhat irregular.

The results of this test in both Tables SC4-2 and SC4-4 show that the OC group performed the best on this test. There is no clear difference between IEL and SQ. There is essentially no difference between boys and girls on this test. Our limited data indicate (Table SC4-3) that younger students scored higher than older students on this test.

The general distribution of student scores in Figure SC4-1 indicates that there is a very high concentration of students spread out evenly all through the middle range from 30-80. The group distributions in the next 3 figures show dramatic differences among the groups. The IEL distribution peaks in the 30's whereas the OC distribution peaks in the 70's with most scores between 60 and 90. The SQ distribution is rather nondescript normal with a peak in the 50's.

Table SC4-1

Grade 4 Science Posttest Population

	No. of schools	No. of studs.	% boys(1)	Mean(2) age	% Repeater (3)	% Preschool (4)	Mean(5) absent
IEL	5	118	71.2	16.9	16.7	98.1	10.9
OC	5	96	75.3	14.1	2.2	24.4	5.5
SQ	5	74	75.0	16.0	29.2	20.8	8.3
Overall	15	288	73.4	16.0	12.0	55.4	8.7

Notes:
(1) 17 missing cases
(2) 127 missing cases
(3) 213 missing cases
(4) 167 missing cases
(5) 146 missing cases

Table SC4-2

Grade 4 Science Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	45.0	16.2	41.4	18.1	44.0	16.8
OC	64.0	17.3	64.8	14.0	62.5(1)	18.2
SQ	49.7	15.9	51.8	15.6	49.6(1)	16.1
Overall	52.3	18.4	50.6	19.0	51.6	18.5

Notes:
(1) The results for the total group are lower than the separate results for boys and girls because the missing cases bring the scores down.
(2) Student scores range from 3.3 to 90.0
(3) The difference between OC and IEL is significant at the .001 level with t=7.75.
(4) The difference between OC and SQ is significant at the .001 level with t=4.81.
(5) The difference between SQ and IEL is significant at the .05 level with t=2.31.

Table SC4-3

Grade 4 Science Results by Age Groups

	Age 9-14		Age 15-17		Age 18-25	
	No. of studs.	Mean % correct	No. of studs.	Mean % correct	No. of studs.	Mean% corr.
IEL	27	50.2	23	42.0	42	33.5
OC	29	63.3	12	64.7	3	52.2
SQ	5	38.7	13	38.7	7	40.5
Overall	61	55.5	48	46.8	52	35.5

Table SC4-4

Grade 4 Science Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	49.2	13.8
OC	5	55.2	18.9
SQ	5	46.8	12.3
Overall	15	50.4	14.6

Note: None of these differences is significant at the .05 level.

Table SC4-5

Grade 4 Science Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	27	80.7	5.5
JS Milton	IEL	11	71.2	5.6
EJ Yancy	OC	45	62.9	11.9
Martha Tubman	SQ	27	62.0	11.1
Yanniquelle	OC	6	58.9	11.5
Mamadee	SQ	5	56.0	8.0
Frelela	IEL	23	51.6	12.6
Nyofarkollie	SQ	22	46.4	11.5
Gorpu Dolo Boi	IEL	14	46.2	12.8
SS Collins	IEL	20	42.7	15.4
Corporal Woah	OC	5	39.[illegible]	9.8
Gorlu	SQ	12	35.6	15.7
Dorothy Cooper	IEL	50	34.4	13.0
Gbelenah	SQ	8	34.2	12.7
Ganglota	OC	13	34.1	10.1

Figure SC4-1

Grade 4 Science Posttest Distribution of Scores

```
code
     I
  0. *** (      4)
     I
     I
     I
 10. *** (      3)
     I
     I
     I
 20. ************ (     23)
     I
     I
     I
 30. ************************** (     49)
     I
     I
     I
 40. ************************* (     48)
     I
     I
     I
 50. *************************** (     53)
     I
     I
     I
 60. ********************* (     41)
     I
     I
     I
 70. ********************** (     44)
     I
     I
     I
 80. ************ (     22)
     I
     I
     I
 90. ** (      1)
     I
     I
     I.........I.........I.........I.........I.........I.........I
     0         20        40        60        80        100
     frequency
```

Figure SC4-2

Grade 4 Science Posttest Distribution of IEL Scores

```
code
      I
   0. **** (      3)
      I
      I
      I
  10. *** (      2)
      I
      I
      I
  20. ************ (     11)
      I
      I
      I
  30. ********************************** (     33)
      I
      I
      I
  40. ************************* (     25)
      I
      I
      I
  50. ******************* (     18)
      I
      I
      I
  60. ************** (     13)
      I
      I
      I
  70. ************ (     11)
      I
      I
      I
  80. *** (      2)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

Figure SC4-3

Grade 4 Science Posttest Distribution of CC Scores

```
20. ******** (      7)
    I
    I
    I
30. ******** (      7)
    I
    I
    I
40. ********* (      8)
    I
    I
    I
50. ************* (     12)
    I
    I
    I
60. ******************** (     19)
    I
    I
    I
70. ************************ (     23)
    I
    I
    I
80. ******************** (     19)
    I
    I
    I
90. ** (      1)
    I
    I
    I.........I.........I.... ....I.........I.........I
    0         10        20        30        40        50
    frequency
```

Figure SC4-4

Grade 4 Science Posttest Distribution of SQ Scores

```
code
      I
  0.  ** (      1)
      I
      I
      I
 10.  ** (      1)
      I
      I
      I
 20.  ****** (      5)
      I
      I
      I
 30.  ********** (      9)
      I
      I
      I
 40.  ****************** (     15)
      I
      I
      I
 50.  ************************** (     23)
      I
      I
      I
 60.  ********** (      9)
      I
      I
      I
 70.  ********** (     10)
      I
      I
      I
 80.  ** (      1)
      I
      I
      I.........I.........I.........I.........I.........I
      0         10        20        30        40        50
      frequency
```

GRADE 4 SOCIAL STUDIES POSTTEST

The grade 4 social studies results are available from 278 students in 14 schools. WAEC was unable to locate the results from the Gbelenah (SQ) school. About 75% of the students were boys with the smallest percentage in IEL schools. The average age of a small sample of 71 students was 15.5 years and there were no differences among the 3 groups of schools.

Table SS4-2 shows the results of the test. The differences among all 3 experimental groups are very large, with OC scoring highest and IEL lowest. These results are confirmed by Table SS4-4 although the differences in the latter table are not quite as large. The results by school are similar to other tests with David Fejue scoring about 83% and other schools ranging from 56% to 30%.

Table SS4-1

Grade 4 Social Studies Posttest Population

	No. of schools	No. of studs.	% boys(2)	Mean(3) age
IEL	5	126	72.0	15.5
OC	5	88	76.9	15.5
SQ	4(1)	64	79.4	15.3
Overall	14	278	75.2	15.5

Notes: (1) No results are available from the Gbelenah school.
(2) 12 missing cases
(3) 207 missing cases

Table SS4-2

Grade 4 Social Studies Posttest Results

	Boys		Girls		Total	
	Mean % correct	SD	Mean % correct	SD	Mean % correct	SD
IEL	38.2	14.0	35.2	10.9	37.3	13.2
OC	58.6	20.3	52.1	12.4	58.7(1)	19.9
SQ	46.5	11.2	45.4	12.3	45.9	11.7
Overall	46.4	17.8	41.8	15.2	46.1	17.9

Notes: (1) The missing cases raised the score for the total group.
(2) Student scores range from 11.6 to 88.4.
(3) All 3 differences between groups in the "total" column are significant at the .001 level.

Table SS4-3

Grade 4 Social Studies Results by School

School	Group	No. of students	Mean % correct	SD
David Fejue	OC	28	82.7	5.2
Ganglota	OC	13	55.8	12.3
Martha Tubman	SQ	26	55.2	8.5
Yanniquelle	OC	6	48.8	8.6
JS Milton	IEL	13	47.4	7.6
Frelela	IEL	24	47.0	12.5
EJ Yancy	OC	36	45.9	12.4
Gorpu Dolo Boi	IEL	14	44.7	7.6
Mamadee	SQ	4	43.0	12.1
Nyofarkollie	SQ	22	40.0	9.0
Gorlu	SQ	12	37.6	8.6
SS Collins	IEL	20	34.9	11.9
Corporal Woah	OC	5	34.9	10.9
Dorothy Cooper	IEL	55	29.8	10.9

Table SS4-4

Grade 4 Social Studies Results with School as Unit

Group	No. of schools	Mean % correct	SD
IEL	5	40.7	8.0
OC	5	53.6	17.9
SQ	4	43.9	7.8
Overall	14	46.3	12.9

Note: None of these differences is significant at the .05 level.

Figure SS4-1

Grade 4 Social Studies Posttest Distribution of Scores

```
code
     I
 10. ******* (     12)
     I
     I
     I
 20. ****************** (     33)
     I
     I
     I
 30. ************************************ (     70)
     I
     I
     I
 40. ******************************** (     59)
     I
     I
     I
 50. ************************** (     50)
     I
     I
     I
 60. ************ (     22)
     I
     I
     I
 70. ******* (     11)
     I
     I
     I
 80. ************ (     21)
     I
     I
     I.........I.........I.........I.........I.........I
     0         20        40        60        80       100
     frequency
```

Figure SS4-2

Grade 4 Social Studies Posttest Distribution of IEL Scores

```
code
     I
 10. ************* (     12)
     I
     I
     I
 20. ************************** (     24)
     I
     I
     I
 30. ************************************** (     37)
     I
     I
     I
 40. ****************************** (     29)
     I
     I
     I
 50. ****************** (     18)
     I
     I
     I
 60. ******* (      6)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SS4-3

Grade 4 Social Studies Posttest Distribution of OC Scores

```
code
     I
 20. ***** (      4)
     I
     I
     I
 30. ****************** (     16)
     I
     I
     I
 40. ************* (     12)
     I
     I
     I
 50. ******************* (     17)
     I
     I
     I
 60. ********** (      9)
     I
     I
     I
 70. ********** (      9)
     I
     I
     I
 80. ************************ (     21)
     I
     I
     I.........I.........I.........I.........I.........I
     0         10        20        30        40        50
     frequency
```

Figure SS4-4

Grade 4 Social Studies Posttest Distribution of SQ Scores

```
code
     I
 20. ************** (      5)
     I
     I
     I
 30. ****************************************** (     17)
     I
     I
     I
 40. ******************************************** (     18)
     I
     I
     I
 50. ************************************** (     15)
     I
     I
     I
 60. ******************* (      7)
     I
     I
     I
 70. ****** (      2)
     I
     I
     I.........I.........I.........I.........I.........I
     0         4         8        12        16        20
     frequency
```

OVERALL POSTTEST RESULTS

In this section we will give a brief summary, from a qualitative point of view, of the results of the set of 12 posttests. Table A shows the order in which the mean scores of each experimental group is ranked on each of the 12 tests, when the analysis is done with the individual student as the unit of analysis. The OC group consistently scores highest in grades 1, 2, and 4. The IEL group scores highest in grade 3 with the exception of the third-grade social studies test. If we look at Table B, we see the results when the school is taken as the unit of analysis. With only two exceptions, the highest group in each test confirms the results of Table A. The exceptions are the first-grade mathematics test in which the SQ group now scores highest and the second-grade mathematics test in which the IEL group now scores highest.

An overall conclusion to be drawn from the results of the posttests, taken in isolation, is that in general the OC group performed best, with the IEL group second and the SQ group lowest. The only significant exception is in third grade where the IEL group scored highest. It must be remembered, however, that this conclusion is based only on posttest scores without taking into consideration the incoming levels of the students, schools, or experimental groups. In the following sections we will attempt to see, in each grade level, how the results of these posttests

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relate to earlier measures of student ability, at least in the areas of language and mathematics. (No other tests have been given in science and social studies.)

Table A

Overall Results of Posttests by Ranking

Test	Highest	Middle	Lowest
English 1	OC	IEL	SQ
Math 1	OC	SQ	IEL
English 2	OC	IEL	SQ
Math 2	OC	IEL	SQ
English 3	IEL	OC	SQ
Math 3	IEL	SQ	OC
Science 3	IEL	OC	SQ
Soc. Studies 3	OC	IEL	SQ
English 4	OC	SQ	IEL
Math 4	OC	SQ	IEL
Science 4	OC	SQ	IEL
Soc. Studies 4	OC	SQ	IEL

Table B

Overall Posttest Results by Ranking with School as Unit

Test	Highest	Middle	Lowest
English 1	OC	SQ	IEL
Math 1	SQ	OC	IEL
English 2	OC	IEL	SQ
Math 2	IEL	OC	SQ
English 3	IEL	OC	SQ
Math 3	IEL	SQ	OC
Science 3	IEL	OC	SQ
Soc. Studies 3	OC	IEL	SQ
English 4	OC	IEL	SQ
Math 4	OC	SQ	IEL
Science 4	OC	IEL	SQ
Soc. Studies 4	OC	SQ	IEL

LONGITUDINAL RESULTS IN ENGLISH AND MATHEMATICS

In February 1981 the IEL project staff gave pretests in English and mathematics to the students of grades 1-3 in the same 15 schools. In February 1982 they gave extensively revised versions of the same tests as well as English and mathematics pretests to the fourth-grade students. The 1981 pretests served to check the extent to which the 3 groups of schools were equivalent before the IEL materials or textbooks were introduced. The 1982 pretests measured equivalence of incoming first-graders and in the case of the other grades gave some idea of the effectiveness of the IEL materials in 1981.

In this section we will take each grade and follow it back as far as possible in the areas of English and mathematics in order to see how the present posttest results relate to earlier results. Before beginning this analysis a few words of caution should be said. Even though we pretend to have the same group of students who took, for example, the firt-grade English pretest in February 1981 taking the second-grade English pretest in February 1982 and then the second-grade posttest in November 1982, there will only be a certain percentage (perhaps not over 50%) of the students who are the same, because of problems of dropout, repetition, late registration, and absence. Unfortunately we do not have extensive enough student records to enable us to determine which students took all 3 tests.

Because of the form in which pretest results are available to me, it is necessary to restrict this present analysis to a fairly simple level. The analysis has to be done with the school as the unit of analysis since for the 1982 pretests I have no results by student. Nor are individual school scores available on all of the tests, so that a complete statistical analysis cannot be done. In the 1982 pretests, for grades 1 and 2 separate English and mathematics scores are also not available, so that only one overall group score is given for each group. In view of these limitations on available data I have decided to present a simple qualitative picture based on order of rankings of mean scores (with school as the unit of analysis). There is little reason to present actual scores since all of the tests are different. For each grade we can follow the same cohort of students from the beginning of 1981 (or 1982 in the case of first grade) and compare the 3 experimental groups at different stages, albeit on different tests, in the same subject area.

In Table C we see the results of the 1982 pretests and posttests for the 1982 first-grade students. At the beginning of the year the SQ group started slightly higher on the combined test with IEL next and OC lowest. By the end of the year IEL students had dropped to last place. This seems to indicate that the low IEL scores on first-grade posttests were not due to their having started out lower. Whether it is due to the ineffectiveness of the IEL materials, or the schools using the materials ineffectively, or some other reason is not clear.

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If we compare the first-grade pretest results from 1981 with the second-grade pretest results from 1982, in Table D, then this seems to suggest that the IEL materials were relatively effective in 1981 in first grade.

Table D gives a history of the students who took the 1982 second-grade posttests, from the beginning of first grade in early 1981. At the beginning of first grade these IEL and OC groups were slightly higher than the SQ group. At the beginning of second grade the IEL group scored much higher than either the OC or SQ group, which may indicate -- as already mentioned -- that the first-grade IEL materials may have been quite effective in 1981 for these students. At the end of second grade, however, the IEL and OC groups were more even again, with IEL coming out slightly higher in mathematics and OC in English. Considering that apparently the IEL group scored much higher at the beginning of 1982, it appears that the use of the second-grade materials in 1982 was not particularly effective.

Table E shows the development of the third-grade students during the years 1981-82. Once again the SQ schools have consistently come out lowest in both subjects. In English this group of IEL students has done well over two years, beginning by scoring lower than the OC students and finishing up by scoring much higher than either group. In mathematics the results are less conclusive since the IEL students began much higher already, and maintained that status. We can at least conclude for this group that the IEL materials in second and third grade mathematics helped to maintain a high level.

In Table F we see results for the 1982 fourth-grade students. In English the IEL students started out slightly higher at the beginning of third grade, maintained the slight advantage at the beginning of fourth grade but then finished the end of fourth grade lower than the CC students, which would argue for the ineffectiveness of the fourth-grade English IEL materials. In mathematics the situation is even worse for the IEL schools. They started out much higher in third grade, slightly higher at the beginning of fourth grade but then dropped dramatically by the end of fourth grade. In this case it seems quite clear that use of fourth grade IEL mathematics materials resulted in a drop of achievement level.

Table C

Longitudinal Results for 1982 Grade 1 Groups

Test	Highest	Middle	Lowest
Overall grade 1 pretest 1982	SQ	IEL	OC
English grade 1 posttest 1982	OC *	SQ	IEL
Math grade 1 posttest 1982	SQ	OC	IEL

Note: * indicates that the difference between this group and the next lower group is at least 5 percentage points. This convention is used in Tables C-F.

Table D

Longitudinal Results for 1982 Grade 2 Groups

Test	Highest	Middle	Lowest
English grade 1 pretest 1981	IEL	OC	SQ
Math grade 1 pretest 1981	OC	IEL	SQ
Overall pretest grade 2 1982	IEL*	OC	SQ
English grade 2 posttest 1982	OC	IEL*	SQ
Math grade 2 posttest 1982	IEL	OC	SQ

Table E

Longitudinal Results for 1982 Grade 3 Groups

Test	Highest	Middle	Lowest
Grade 2 English pretest 1981	OC	IEL*	SQ
Grade 3 English pretest 1982	IEL*	OC	SQ
Grade 3 English posttest 1982	IEL*	OC	SQ
Grade 2 Math pretest 1981	IEL*	OC	SQ
Grade 3 math pretest 1982	IEL*	OC*	SQ
Grade 3 math posttest 1982	IEL*	SQ	OC

Table F

Longitudinal Results for 1982 Grade 4 Groups

Test	Highest	Middle	Lowest
Grade 3 English pretest 1981	IEL	SQ	OC
Grade 4 English pretest 1982	IEL	SQ	OC
Grade 4 English posttest 1982	OC	IEL	SQ
Grade 3 math pretest 1981	IEL*	SQ	OC
Grade 4 math pretest 1982	IEL	OC	SQ
Grade 4 math posttest 1982	OC*	SQ*	IEL

CONCLUSIONS

Summing up, the data in the preceding sections suggest the following conclusions about the effectiveness of IEL materials in English and mathematics:

(1) We are left in doubt about the first-grade materials. The 1982 pretest scores for second grade indicate that the materials were relatively effective in 1981, with the IEL and OC groups starting out evenly at the beginning of the year and the IEL group scoring much higher at the beginning of the next year. However, the 1982 posttest scores indicate that for the next cohort in 1982 the IEL first-grade materials were not effective, with the IEL group beginning the year in the middle and finishing last of the 3 groups.

(2) Similarly, the results for grade 2 are somewhat mixed. The 1982 third-grade pretest results suggest that the second-grade English materials were effective in 1981 for that group of students. In 1982 for the next cohort the results were slighly negative in English, with the group starting high but finishing second. No conclusions can be drawn about mathematics materials in second grade, since in all cases the IEL group began higher and finished higher.

(3) No strong conclusions can be drawn from these data about the use of third-grade IEL materials since in both years the IEL began highest and remained that way.

(4) The fourth-grade materials were definitely not effective in 1982, the only year in which they have been used outside the lab school. In both English and mathematics

the IEL group began the year ahead of the other two groups. At the end of 1982 the IEL fourth-grade group was second in English and last in mathematics.

(5) No pretest scores are available in social studies or science. Posttest results for 1982 indicate that of the IEL materials in the third and fourth grade in these subjects only the third-grade science materials were effective. The third-grade social studies materials were not effective nor were the fourth-grade materials in either area.

As was mentioned at the beginning of this report, the textbooks for the OC schools did not arrive in time to affect the outcome of these posttests. The only difference between the treatments for the OC and SC schools was a short teacher training course for OC teachers at the beginning of 1981. It is very unlikely that this course would raise scores significantly in the OC schools. Thus the only explanation for the advantage in OC posttest results seems to be the fact that they started higher in 1981, and the "luck of the draw" in having the David Fejue school in the OC group, which scored much higher than any other school on most tests. Although David Fejue scored relatively high in the 1981 pretests its performance was not outstanding as was the case in these posttests. I do not know to what one can attribute the present exceptional performance.

PROBLEMS AND RECOMMENDATIONS

In this section we will outline briefly a few problems possibly affecting the validity of the present evaluation and, where possible, make recommendations to improve the situation for the 1983 evaluation of grades 1-5 involving 45 schools. The main problems seem to be:

(1) Small number of schools in the sample

There were relatively large numbers of students, generally over 100 in each experimental group on each test except for fourth grade. However, it is well known in educational achievement results that the school and classroom have a big effect on individual student scores. This effect makes it dubious that analysis of scores of individual students is a reliable indicator in a study of this type. Many experts believe that analysis with the school, or classroom, as unit is more reliable. The 5 schools in each experimental group is not enough for reliable results. One exceptionally bad or good school in an experimental group can carry too much influence on the outcome for that group. As an example, we have already cited the case of the David Fejue school in the CC group. If we take the individual student as unit, on the other hand, then a large school will determine the outcome of its group, as happened with Dorothy Cooper school in the IEL group. The solution to this problem is a good random selection procedure with a relatively large number of schools. The increased sample size, from 15 to 45 schools in 1983, should improve the situation considerably.

(2) Student comprehension of the English language

It is obvious that the students' ability to understand instructions and items is as important as their knowledge of the skill or concept being tested. In general, English comprehension is at a very low level in rural Liberian schools, since English is not -- except in perhaps very few cases -- the native language of the students. Clearly the lack of comprehension of the language of the instructions is confounded with inability to understand a concept, in cases where students get wrong answers. There are three main solutions to the problem. The first would be to simplify even further the language of the tests. Although this is undoubtedly possible on many items, I feel that in general the language level of the tests is about as simple as it can be made. The second solution would be to give instructions and as many of the items as possible, except in parts of the English test, in the students' native language. This would be a radical departure from Liberian government policy in education, however, and would also present several practical problems. The third solution would be to make the tests as language independent as possible. This is easiest in mathematics, where it has in fact been done in part on the mathematics posttests, and most difficult in English. Some further efforts could be made in this direction, but would require drastic revisions, and a great deal more of experimenting with test item formats. With present resources it is unlikely to happen. It seems that we are probably stuck with the problem of English comprehension. On the positive side, it is at least

intuitively plausible that the problem affects all 3 groups about equally, and although it may affect the ability of the tests to discriminate among the groups, it will probably not reverse the direction of the outcomes.

(3) Use of taped instructions

This seems to be the issue that raises the most controversy. In reading the reports of the test administrators as well as comments of school principals and teachers, the comments span the full range of high praise of the tapes to total condemnation. In Daryl Nichols' trip report of 11 October to 3 December 1982 he suggests that the use of tapes was the biggest problem in the test administration. Nichols states that (page 26), "The tape recording of instructions and its administration without adequate tryout and revision is not professional -- regardless of the reason for not trying out the materials, the recorders, and the process." In this I agree; they should have been tried out in the tryout tests. Nichols also expresses concern (page 20) that real differences might not be measured. I believe that this concern has not become manifest. As evidence for this belief I rely on the following:

a) Overall item results were similar to results obtained in tryouts, when instructions were not taped.

b) Differences between groups and schools are generally as high in grades 1-3 with taped instructions as in grade 4 where instructions are written.

c) Student test scores on almost all tests, as shown in the figures in this report, generally had a reasonable distribution from very low to very high, indicating that the tests did discriminate.

In general I believe that many of the comprehension problems attributed to the tapes are in fact due to the English comprehension problems referred to earlier. In spite of what I feel are reasonable results, I recognize the shortcomings inherent in the use of taped instructions. Many of these could be overcome by improved training procedures for test administrators and improved planning. The alternative is to use oral instructions read by either the test administrator or the students' classroom teacher. In this case I feel that we will have lost control of the attempt to standardize test administration. Instructions will be read at different speeds with different degrees of comprehensibility, pauses will be different in each class, and many mistakes will be made in reading the instructions. Personally, I feel that the shortcomings of this method will be greater than those arising from the use of the tapes. However, because of the criticisms made from several directions, I recommend that in 1983 the tapes not be used. If we are going for increased comprehension of instructions on the part of the student, then it is probably better to have the classroom teacher, whose way of speaking is familiar to the students, read the instructions rather than the test administrator.

(4) Data gathering

Because of the inadequacy of data this year, it has been impossible to report a more sophisticated analysis, which might have given better insights into the effects of IEL materials. In March 1983 I discussed with IEL staff, as

well as Dr. Agbenyega, new formats and techniques for data collection in 1983. It is most important that IEL and WAEC cooperate fully on this issue. Because of the problems of transportation arising from WAEC having its office in Monrovia, it is probably more reasonable to have IEL in charge of collecting data to which they should give full access to WAEC.

(5) Irregularities in the testing process

There were many problems in the administration of tests, as reported by test administrators and in the follow-up study done by IEL and reported by Daryl Nichols. Many of these had to do with malfunctioning tapes and recorders, while others were due to improperly packaged test materials. In the scoring of the tests WAEC apparently lost the student results from 3 tests at one school on each test. It is difficult to assess the cumulative impact of all of these irregularities. They do definitely affect the results, but nobody knows to what extent. There are probably other problems that have not been called to our attention. From the evidence I have seen it does not seem that in general the evaluation has been in any serious sense invalidated by the irregularities, lamentable as they are. We hope that with added experience the 1983 testing will experience fewer problems. We will attempt to improve planning and control of the materials as well as the training given to administrators.