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PROGRESS REPORT
to the
AGENCY FOR INTERNATIONAL DEVELOPMENT
on the
AFRICAN MATHEMATICS PROGRAM
January 1, 1967 to October 31, 1967
under
AID Contract RES/21 and csd-1567

Education Development Center, Inc.
55 Chapel St.
Newton, Massachusetts 02158

November 30, 1967

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PROGRESS REPORT

The following is a Progress Report to the Agency for International Development on the African Mathematics Program of Education Development Center, Inc., for the period October 1, 1966 to November 31, 1967. The principal activities during the period under AID Contract Res/21 and csd/1567 include:

- 1) holding the 1967 Mathematics Workshop to continue the preparation of mathematics texts for Tropical Africa;
- 2) organizing Institutes in Tanzania, Mid-Western Nigeria, Malawi, Federal Region - Nigeria, Eastern Nigeria, Liberia, Sierra Leone, Uganda, Ghana and Ethiopia, to train teachers of trial classes, head teachers and ministry officials to use the Entebbe Mathematics Series;
- 3) arranging for completion of publication of the manuscripts written at the 1966 Workshop and for distribution of the Entebbe Mathematics Series to African schools and teacher-training colleges;
- 4) holding at University College, Nairobi, the second residential period of the ABC Institute, a two-year program aimed at preparing senior African teacher-training college tutors of mathematics, ministry mathematics supervisors and African university mathematicians to undertake leadership in introducing modern mathematics into African primary and secondary schools and training colleges;
- 5) visits to participating countries, in June, July and August by Professor W. T. Martin, Mr. H. P. Bradley and Mr. John Joanou, to discuss the program.

1. The 1967 Workshop

The sixth annual Mathematics Workshop was held at the Nyali Beach Hotel, Mombasa, Kenya, July 3 - August 12, 1967, under the chairmanship of Professor W. T. Martin and Dr. D. K. Abbiw-Jackson. Primary Six Pupil Text and Teachers' Guide, Primary Teachers' Handbook I-VI and two volumes of Additional Mathematics were prepared at the Workshop by a group of thirty-seven mathematicians and teachers (see Report and Participant List - Appendix A).

The Testing Group prepared tests for Primary Three, Primary Five and Secondary C Two.

A meeting of the Steering Committee of the African Mathematics Program was held August 3, 1967 at the Workshop (see Report - Appendix B).

2. Teacher-Training Institutes

Earlier reports to AID (March 4, 1964, January 31, 1965, September 30, 1965, December 30, 1965, May 31, 1966, October 30, 1966 and January 31, 1967) described 27 courses held in the participating countries to train teachers and supervisors of experimental classes as well as participation in other related mathematics improvement efforts in Tropical Africa.

Ten Teacher-Training Institutes have been held in eight African countries from December 1966 to October 1967 (see Reports of Teacher-Training Institutes - Appendix D).

Two recent Institutes were held in August/September, one in Ghana for Primary Five, and one in Ethiopia for Secondary C One.

Discussions with officials of the Ministries and Curriculum Development Centers, and faculty members during the annual visit to Africa resulted in requests for twenty-four Institutes within the coming year.

Teacher-Training Institutes

January 1, 1967 - November 30, 1967

Tanzania

Date: December 29, 1966 - January 11, 1967

Site: University College, Dar es Salaam, Tanzania

Organizer: Ministry of Education, Tanzania

Director: Mr. M. Kinunda, Ministry of Education and
Mr. J. E. Phythian, Head of Mathematics Department,
University College, Dar es Salaam

Lecturers: Professor Paul Johnson, University of California, Los Angeles, Calif.
Mr. J. E. Phythian, Head of Mathematics Department, University College
Dr. J. E. Roberts, Visiting Professor, University College
Mr. K. H. Swinden, Mathematics Department, University College
Mr. D. Woodhouse, Mathematics Department, University College
Dr. A. Beninati, Institute of Education, University College
Mr. D. Morris, Curriculum Development Centre, Nairobi

Participants: 53 Secondary School Teachers

Mid-Western Nigeria

Date: January 3 - 14, 1967
Site: Mid-Western Technical College, Auchi, Mid-Western Nigeria
Organizer: Ministry of Education, Benin City, Mid-Western Nigeria
Director: Dr. Grace A. Williams, Faculty of Education, University of Lagos
Lecturers: Dr. Grace A. Williams
Professor Vincent Haag, Franklin & Marshall College, Lancaster, Penna.
Participants: 38 Primary Teachers, 13 Secondary Teachers, 10 Tutors,
8 District Inspectors

Malawi

Date: January 9 - 20, 1967
Site: Blantyre Secondary School, Blantyre, Malawi
Organizer: Ministry of Education, Malawi
Director: Mr. Frank Kazembe, Chief Inspector of Schools, Limbe, Malawi
Lecturer: Donald E. Richmond, Professor Emeritus, Williams College,
Williamstown, Massachusetts
Participants: 36 Primary and Secondary Teachers, 10 Tutors, 4 Headmasters,
3 District Inspectors

Eastern Nigeria

Date: January 15 - 17, 1967
Site: Center for Continuing Education, Nsukka, Eastern Nigeria
Directors: Dr. Onyerisara Ukeje, Acting Director, Institute of Education
Dr. Richard Mastain, Peace Corps Educational Director
Lecturer: Professor Paul Johnson, University of California, Los Angeles, Calif.
Participants: 14 Peace Corps Volunteers

Liberia

Date: January 18 - February 5, 1967

Sites: Monrovia Demonstration School, Monrovia, Liberia
Kakata Teachers Training College
Gbarnga, Ganta and St. Teresa

Organizer: Mrs. Doris Banks-Henries, Department of Education and
Mr. John Norris, Peace Corps Volunteer

Director: Mrs. Doris Banks-Henries, Director of Higher Education, Liberia

Lecturer: Professor Paul Johnson, University of California, Los Angeles, Calif.

Participants: 35 Elementary School Teachers

Sierra Leone

Date: March 28 - April 8, 1967

Site: Milton Margai Training College, Goderich

Organizer: Ministry of Education, Sierra Leone

Director: Mr. F. E. Dyck-Harding, Milton Margai Training College, Goderich,
Sierra Leone

Lecturers: Dr. John Simbo, Mr. Julius Jonah
Mrs. Margaret Greene, Mr. F. E. Dyck-Harding
Dr. Awadagin Williams, Miss Florence Hedd (All from Sierra Leone)

Participants: 30-40 Primary School Teachers

Uganda

Date: April 17 - 22, 1967

Site: Makerere University College, Kampala, Uganda

Organizer: National Institute of Education, Makerere University College

Director: Dr. Rowland C. Anderson, Lecturer, Makerere University College

Lecturer: Professor Roy Dubisch, University of Washington, Seattle, Washington

Participants: 22 Demonstration School Teachers from Primary Teacher Training
Colleges, 24 from Teacher Training Colleges, 19 Area Education
Officers

Eastern Nigeria

Date: April 27 - May 11, 1967
Site: Institute of Education, University of Nigeria, Nsukka, Eastern Nigeria
Organizer: Ministry of Education and University of Nigeria
Director: Mr. Pius M. Igboko, Department of Education, University of Nigeria
Dr. B. Onyerisara Ukeje, Acting Director, Institute of Education,
University of Nigeria
Participants: 70 Secondary School Teachers
(Report not yet available)

Ethiopia

Date: August 15 - September 1, 1967
Site: Haile Selassie I University, Addis Ababa, Ethiopia
Organizer: Ministry of Education, Ethiopia
Director: Mr. John C. Fitzgerald, Ministry of Education
Ato Yohannes Menkir, Haile Selassie I University
Lecturers: Professor Paul Johnson, University of California, Los Angeles,
California
Professor B. J. Pettis, University of North Carolina
Participants: 90 Secondary Teachers and 3 Peace Corps Volunteers

Ghana

Date: August 27 - September 8, 1967
Site: University of Ghana, Legon, Ghana
Organizer: Ministry of Education, Ghana
Director: Miss Lucy L. Addy, Ministry of Education
Lecturers: Professor Shirley A. Hill, University of Missouri
Dr. D. K. Abbiw-Jackson, University of Science & Technology
Participants: 18 Headteachers, 30 Primary Teachers, 5 Peace Corps Volunteers

3. Publication and Distribution of Entebbe Mathematics Series

Members of the Primary Writing Group at the 1966 Workshop prepared a Pupil Text and Teachers' Guide for Primary Five. The Secondary Writing Group prepared a Pupil Text and Teachers' Guide for Secondary C Three Geometry and Secondary Five.

During this report period, Science Research Associates, Inc. (SRA) of Chicago, under a sub-contract from EDC to publish and distribute the Entebbe Mathematics Series, completed publication of the Student Text and Teachers' Guide for Primary Five, Secondary C Three Geometry and Secondary Five. It was hoped that the 1966 Workshop texts would be ready in time for the 1967 Workshop in July. Unfortunately, publication was delayed and a number of delivery dates were not met. Consequently Primary Five became available for distribution in September 1967, Secondary Five in October and Secondary C Three Geometry in November 1967. Including these latest texts there is now a total of sixty-one volumes in the Entebbe Mathematics Series.

Our present sub-contract with SRA provides for the publishing of Primary Six Pupil Book and Teachers' Guide and a Teachers' Handbook Primary I-VI. Negotiations are currently under way for reprinting Secondary C Two Algebra, Secondary C Three Algebra and Secondary Four.

Through special permission granted by AID, a revised edition of Basic Concepts of Mathematics, Volumes I and II are being printed by SRA Ltd., England and will be available for distribution in December. A reprinting of Secondary C One Algebra and Geometry was completed by SRA Ltd., and these books are currently being distributed directly from England to Africa.

4. ABC Institute

The ABC Institute, an activity of the African Mathematics Program sponsored by Education Development Center, is financed by a Ford Foundation grant for support of teacher-training institutes for the improvement of mathematics teaching in Africa. The Institute is a two year program (1966-1968) which aims to make available in each participating country a core of people who will undertake the supervision of development of curricular reform in mathematics, and who will bring about the necessary re-education of teachers and tutors.

"ABC" refers to the categories of African participants: A-participants are senior mathematics tutors from teacher training colleges; B-participants are the officials in the Ministry of Education who are responsible for mathematical education, or who are likely to assume such responsibility; C-participants are lecturers in mathematics from African universities who have been invited to assist in instruction at the Institute. During the 1967/68 phase of the Institute a D group, consisting of secondary school teachers, was added.

The second residential session of the ABC Institute was held for a second time at University College, Nairobi, July 2 - 28, 1967 under Professor B. J. Pettis, Chairman. The Institute had sixty-three participants including forty-two A and B, five C and sixteen D participants. (see Progress Report on ABC Institute - Appendix J.)

5. Africa Travel Report

During the summer months, Professor W. T. Martin, Mr. Hugh P. Bradley and Mr. John Joanou visited all the participating countries with the exception of Nigeria. The purpose of this travel was to visit Ministries of Education, local USAID Officers and local Peace Corps Directors, to discuss the African Mathematics Program and to observe Entebbe texts being used in the classroom.

A detailed report of conversations with the Ministry, AID and Peace Corps officials will be found in Appendix F. Arising from these summer visits it has been possible in some countries to bring about close co-operation with the Peace Corps. For example, at the request of the local ministries, Peace Corps Volunteers have been assigned to supervise the use of Entebbe mathematics in Ethiopia, Kenya, Liberia and Sierra Leone. Copies of reports of the activities of two of these volunteers appear in Appendix G and H.

Planning Ahead

Testing and Evaluation: In the past, the testing and evaluation of the program has been supervised by the Testing Group of the Workshop, with Dr. Dilworth, Dr. Lappan and Mr. Chris Modu maintaining contact throughout the year. This task has now become too large for such intermittent supervision. In the coming year, the newly formed Department of Research at EDC will be responsible in this area. It will also be responsible for preparing a deeper study of the social and the educational effects of the program. In this connection it will be necessary for representatives of the Department of Research to make regular visits to Africa.

The Future: In the next year or two, the Program will be entering a new phase in its work. Many of the participating countries are already giving clear indications that not only have they made decisions to adopt modern mathematics in all their schools, but some have already begun to take the initial steps to achieve this objective. At the same time it has become clear that the activities of the program are entering a phase where it is becoming difficult to identify research activities as opposed to implementation activities. These developments indicate that the time is approaching when the program can no longer be supported mainly from research funds. Fortunately other branches of U.S. AID/Washington have shown a sympathetic interest in our achievements and our longer-term objectives.

The changing direction of interest will make necessary a different approach to the general administration of the program. In the past the Pan-African aspect of the work has been encouraged and developed. With the need to produce textbooks and build up intellectual approval at Ministry and Administrative levels, such an approach was wise and economical. Now however, there is a different need. Programs of implementation in the different countries will require close co-operation with each and a detailed knowledge of the different problems affecting each.

In the coming years help in mathematical education will be most appreciated if it responds to the special needs of each country. These needs are affected by different attitudes to the use of non-local material, the need for expatriate assistance, the local availability of mathematical help and the present weaknesses of the existing teaching cadre. Many of the factors affecting local implementation of mathematic curriculum reform are examined in greater detail in Appendix I "From Innovation Towards Implementation".

* * *

In conclusion, EDC wishes to express its thanks to the Office of Program Policy and Co-ordination of AID/W, to the Contract Officers of AID/W responsible for RES/21 and csd-1567 and to the educational advisors of the AID missions in the participating countries for their co-operation in this joint effort to improve mathematics education in Tropical Africa.

THE MOMBASA MATHEMATICS WORKSHOP

APPENDIX A

SUMMER 1967

by Dr. Iya Abubakar

A team of primary, secondary and university mathematics teachers, education administrators and a pool of secretaries gathered together at Nyali Beach Hotel, Mombasa, Kenya, on July 1, 1967. They were drawn up from Ghana, Liberia, Malawi, Nigeria, Sierra Leone, Tanzania, Zambia and the United States. This group constitutes the sixth Mathematics Workshop. Their assignment over the following six weeks was to continue with the work of the previous Entebbe Mathematics Workshops of producing material on modern mathematics for use in African primary and secondary schools. The Workshop was under the chairmanship of Professor W. T. Martin and Dr. D. K. Abbiw-Jackson.

First Plenary Session

The Workshop was officially opened by Mr. M. Mathenge, Coast Province Commissioner. After some remarks by Professor Martin reports on the position of Entebbe mathematics in each participating country were given. One general picture which emerged from the reports was the interest in new mathematics shown in all the countries and the strong enthusiasm with which both students and teachers who have been privileged to be exposed to Entebbe mathematics received it. After these reports the chairman of each writing group gave a tentative outline of what the group hoped to achieve during the period of the Workshop.

Organisation of the Writing Groups

As in previous years, after the plenary session, the Workshop broke up into three working groups as follows:

- (1) Primary Group. This was under the chairmanship of Professor Clarence E. Hardgrove. It set out to write Primary Six and a Teacher's Handbook for Primary One - Seven.
- (2) Testing Group. Professor Peter A. Lappan was the chairman of this group. Their objective was to produce tests for Primary Three, Primary Five and Secondary C Two and also to attempt writing a syllabus and a specimen examination paper for the Additional Mathematics.
- (3) Secondary Group. This group, under the co-chairmanship of Dr. Hartley Rogers and Dr. Abbiw-Jackson, worked to prepare materials for a two-year course in Additional Mathematics leading to the O-level examination. It was planned to prepare a course which could be taken by students who had followed the Entebbe course--or a traditional course or any other modern course.

Steering Committee Meeting

The Steering Committee of the African Education Program met on August 3, 1967. Professor Martin welcomed the three new members of the committee: Professor Shirley Hill, Professor Peter Lappan and Ato Yohannes Menkir. Several reports were submitted and discussions on various items ensued. Some of these are as follows:

- (1) The chairmen of the writing groups gave reports of the progress of their respective groups and Professor Pettis reported on the satisfactory progress of the ABCD Institute.
- (2) The contents of the Additional Mathematics Syllabus were discussed and a small committee was assigned to go into it in more detail.
- (3) The plans by participating countries to organise Institutes were discussed.
- (4) Tentative plans for the 1968 Workshop were drawn up. The Primary group is to prepare material for Primary Seven. The plans of the

Testing group include (a) the review of the results of the pretesting of tests for Primary Three, Primary Five and Secondary C Two done during 1967-68 and possible modification of these tests for future use, (b) construction of new tests for Secondary C Three, (c) preparation of a syllabus and specimen examination for the A-level program, (d) investigation of the examination needs of the teacher-training colleges, and (e) possible setting of a specimen primary leaving examination based on the Entebbe program. The Secondary group plans to tackle the A-level material.

- (5) The plan to have a film on Entebbe mathematics material was discussed. It was reported that the Ghana Film Company is willing to work with the EDC Film Unit on the project and negotiations are in progress to conclude the agreement.

Lectures, Seminars and Films

Monday, Tuesday and Thursday evenings were devoted to lectures, seminars and film shows. The aim of these was to enrich and extend the scope of intellectual discussions beyond the subject matter of the Entebbe mathematics. The titles for the lectures were: "Old Maths" (Ostberg), "Illegal Operations" (Hilton), "What is Truth?" (Lopez-Escobar), "Mathematical Thinking" (Abubakar) and "Mathematical Ethics" (Rogers). The films, which were both interesting and stimulating, were on various topics in modern mathematics.

Visits and Educational Contacts

A close liaison was maintained with the Provincial Education Office and local schools and colleges. Once again, the officers of the Provincial Education Office were most co-operative in setting up meetings and visits. In particular, visits were made to local secondary schools and training

colleges by the Additional Mathematics group and the Primary group.

One additional activity of the Workshop was the staffing and supervision of an in-service course in modern mathematics for the teachers of the Fahari Primary School, which is using the Entebbe materials in five years.

Modus Operandi

- (1) Primary. Under the chairmanship of Professor Hardgrove, the primary writing group was broken up into subgroups responsible for writing the different chapters of Primary Six texts and its Teacher's Guide, and the Primary One - Seven Teacher's Handbook. An innovating feature of these subgroups this year was the appointment of African chairmen to subgroups.
- (2) Additional Mathematics. There were two main groups in Additional Mathematics: Discreet Mathematics, under the chairmanship of Dr. Hartley Rogers, and Non-Discreet Mathematics, under Dr. Abbiw-Jackson. Writing subgroups responsible for chapter production and consisting of African and American participants were formed. On finishing the first draft each subgroup had to present and defend its material before an editorial committee consisting of the two co-chairmen, a member of the writing group and one other participant.
- (3) Editorial Teams. At the end of six weeks the main body of participants departed, leaving small editorial teams for each writing group. These teams undertook some rewriting and did much to prepare clean copy for the publisher.

Achievements

The main objectives of the Workshop were achieved. To a large extent the materials for Primary Six text and Teacher's Handbook were completed,

and the materials for the Additional Mathematics course, although more than originally anticipated, were largely finalized. However, the troubles in Nigeria, the absence of the Biafran and Western Nigerian participants and the early departure of Professor Kulier (caused by the riots in Detroit) delayed the completion of the work and made necessary much more post-Workshop writing and editing than in former years. As a result of this, it is unlikely that the publisher will receive the materials before the end of 1967.

Workshop Administration

The working facilities offered by the Nyali Beach Hotel were excellent. A large lounge was given over entirely to the Workshop, making available three workrooms and a large meeting hall which was used for films and seminars. In addition, other rooms were given to the Primary group and the Testing group, and, in a separate building, administration offices and a duplicating and printing room. Transport facilities for visits to schools and colleges were very good. It is true to say that the administration of the Workshop was such that the maximum benefit was obtained from the effort of the participants.

Conclusion

In conclusion, it should be placed on record the noble role which the Entebbe mathematics program is playing in the development and encouragement of mathematics education in Africa. The program is achieving this in three ways. Firstly, through the textbooks written at these Workshops, it has placed at the disposal of the African schools modern mathematics written with the children's background in mind. Secondly, including African mathematicians in these Workshops helps to expose these mathematicians to the current innovations in mathematical curriculum in America and Europe and inculcates in them the flair for writing

textbooks. Thirdly, the support given in running Teacher-Training Institutes organised by individual countries is of tremendous benefit, for these teachers constitute the bedrock of our mathematical education. To the organisers of the African Education Program, Africa extends her right hand of fellowship.

1967 MATHEMATICS WORKSHOP PARTICIPANTS
MOMBASA, KENYA

Co-Chairmen: ABBIW-JACKSON, Dr. D.K., Univ. of Science & Technology, Kumasi, Ghana
MARTIN, Prof. W.T., Dept. of Mathematics, Massachusetts Institute of
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Primary Writing Group Chairman: Prof. Clarence E. Hardgrove

ADDY, Miss Lucy L., Ministry of Education, P.O. Box M.45, Accra, Ghana
HAAG, Prof. Vincent H., Dept. of Mathematics, Franklin & Marshall College, Lancaster, Pa.
HARDGROVE, Prof. Clarence E. (Chairman), Dept. of Mathematics, Northern Illinois
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JOHNSON, Mr. Victor I.O., Government Secondary School, Magburaka, Sierra Leone
KREIDER, Prof. Donald L., Dept. of Mathematics, Dartmouth College, Hanover, New Hampshire
LOPEZ-ESCOBAR, Prof. E.G.K., Dept. of Mathematics, University of Maryland, College Park, Md.
MacDOWELL, Prof. Robert W., Dept. of Mathematics, Antioch College, Yellow Springs, Ohio
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ROGERS, Prof. Hartley, Dept. of Mathematics, M.I.T., Cambridge, Massachusetts
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SWAIN, Mr. Henry G., New Trier Township High School, Winnetka, Illinois
WHITE, Prof. Paul A., Dept. of Mathematics, University of Southern California, Los Angeles,
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African Mathematics Program - Program Administrator: Mr. Hugh P. Bradley

November 1, 1967

STEERING COMMITTEE MEETING - MOMBASA

Notes of the Meeting of the African Mathematics Steering Committee held at 6:00 p.m., August 3, 1967 in room 5 of the Nyali Beach Hotel, Mombasa.

Present: Professor W. T. Martin (Chairman), Dr. Abbiw-Jackson, Dr. Iya Abubakar, Mr. H. P. Bradley, Professor V. Haag, Professor C. Hardgrove, Professor S. Hill, Professor P. Lappan, Ato Y. Menkir, Mr. C. Modu, Professor B. Pettis, Mr. J. Phythian, and Dr. G. Williams. Professor Martin welcomed the three new members of the committee: Professor Shirley Hill, Professor Peter Lappan, and Ato Yohannes Menkir.

I. REPORTS ON CURRENT WORK

Primary: Professor Clarence Hardgrove reported for the elementary writing group. She stated the goal of this group for the summer was to write Primary 6 and a Teacher's Handbook for Primary 1-6. There is less manpower in the primary section this year, and as a result it appears that both goals will not be reached by the end of the workshop. Primary 6 will have priority.

Additional Maths: Dr. Abbiw-Jackson reported that the additional maths group work is progressing satisfactorily and that this group should be able to reach its goals. In the discussion period following Dr. Abbiw-Jackson's report, a question was raised concerning topics that have not been included in the additional maths syllabus. There was some speculation that the syllabus would come in for criticism from traditional mathematicians on the omission of such items as coordinate geometry and statistics. While ample work on these topics is contained in the Entebbe O-level program, neither is mentioned in traditional O-level maths courses and, therefore, pupils following the combination traditional O-level, Entebbe additional maths would miss these topics. After general discussion, a suggestion was made that the additional maths syllabus specify that the pupil who has done traditional O-level maths is expected to cover certain specific topics in addition to the book.

Professor Martin asked Dr. Abbiw-Jackson, Professor P. Lappan, Mr. C. Modu, and Professor H. Rogers to review the contents of traditional O-level maths to determine what the topics should include if the additional maths is to meet the goal of a self-contained course for pupils with either traditional or modern math backgrounds.

Testing: Professor P. Lappan reported that the testing group is producing a completed test for Primary 3. It has also produced a Primary 5 test and a Secondary C-2 test.

The testing group will do what it can toward writing a syllabus and a specimen examination for the additional maths. These will be turned over to Dr. Abbiw-Jackson and Professor Rogers. The work of the final draft of the syllabus and examination will be left to the additional maths group.

Secondary C-2 tests are to be used in the fall. They should be available by mid-October. It is not a comparative test. There seems to be a great deal of pressure from Tanzania for a comparative test at C-2, C-3, and C-4 level. The general opinion was that while such tests would be very useful, unfortunately the group felt that this is not a task for us. It should be done by an outside organization; perhaps the newly formed East African Examinations Council might

be willing to do it.

Primary 5 is a pre-test, mainly on Entebbe, but it could be used in non-Entebbe classes for purposes of comparison. The Primary 5 test has as broad a base as possible in order to see how Entebbe students do on a wide range of things.

The question of supplying the teacher training colleges with an examination for their students going out to teach maths at levels 1 - 4 was also raised. More and more colleges seem to be using Secondary C as the basic text with Basic Concepts as a supplement. There is also an urgent need for specimen selection type examinations at class 6, 7, and 8 levels for those countries which have secondary selection examinations at these levels.

O-level examinations have been set this fall for two schools in Nigeria. Testing will need a large group in the 1968 workshop.

Professor Martin also reported that EDC plans to employ a psychologist to work part time with the testing group. He will set up testing conditions, collate the material and gather statistics.

ABCD Institute: Professor Pettis reported that the ABCD Institute participants are presently writing correspondence lessons. Fifty-eight people will take the lessons. They will require 3 hours work each two weeks for 30 weeks. There is some choice of topics available to the participants.

Some of the work for the source books is not finished, and must be gathered from the participants. The source books will contain summaries of the lectures as well as selections of the participant's writings. It was also suggested that some of the comments on the Entebbe texts gathered at the ABCD Institute could be included in the source books as helps for the teachers.

Professor Pettis commented that this year's institute shows the results of last year's work. The groups did more writing than last year, and the work improved. Having secondary people helped the program.

II. PLANS FOR FILMS AND INSTITUTES

Films: Professor Martin reported that Miss Lucy Addy had been to the United States to confer with Mr. H. P. Bradley, Professor C. Hardgrove and Professor S. Hill concerning the films to be produced in Ghana. The Ghana film company seems anxious to work with the EDC film unit. Mr. John Friedman of EDC's film unit plans to visit Ghana in this connection in early September.

Institutes: Sierra Leone plans an Institute in Freetown and one up country. The up-country Institute will be run by Mr. Victor Johnson.

Liberia plans to continue with summer courses and with the seminars conducted by the Peace Corps workers. The secondary program is almost entirely a Peace Corps operation.

Ghana plans an institute for September in which Professor S. Hill will participate. There is a one-week institute planned for December. There are also plans to conduct a secondary course organized by Dr. Abbiw-Jackson and the ABCD participants. There will be no expatriate lecturers, but financial aid has been asked for.

There is no information concerning Eastern Nigeria's plans for institutes.

Dr. G. Williams reported plans for an institute in Mid-western Nigeria at Easter. She also said funds are needed for the September conference in Federal Nigeria. Mr. Bradley explained the difficulties of giving aid at such short notice on a short-term contract.

In Northern Nigeria there has been no firm request for help. The program seems to be active. Several independent groups have sent for the materials.

Ethiopia plans to conduct two 3-week Institutes for a total of 100 to 120 secondary school teachers in late August. Professor P. Johnson and Professor B. J. Pettis will carry the main body of the lectures. All secondary schools in Ethiopia will start Secondary C-1 in the fall.

Kenya plans to conduct an Institute for tutors in December, and for secondary teachers in January. They have asked for help.

Uganda is planning an Institute for tutors at Easter and has asked for help.

Tanzania plans three Institutes. EDC has been asked to help in all three institutes.

Zambia plans to start modern math in four areas. Entebbe Maths will be used in the southern region. They plan an Institute for 20 teachers and have asked for help. Modern maths in Zambia at the primary level is going to be based on adaptations of Entebbe texts prepared by Dr. N. G. A. Setidisho.

Malawi plans an institute in December for 30 or 40 teachers

III. PLANS FOR 1968 WORKSHOP

There are several alternatives for primary work in the 1968 workshop. Some schools have six years, some seven, and still others eight years. Pupils who have completed Entebbe Primary 6 would certainly have covered material equivalent to parts of Secondary C-1 and C-2. The two possibilities seem to be 1) laying out the present six year program with additional writing to cover a seventh year or the seventh and eight years, or 2) taking some Secondary C-1 and C-2 material for adaptation and, with additional writing, produce a text to cover Primary 7 and/or Primary 7-8.

Professor Martin reported that he had received a proposed A-level course outlined by Dr. Awadagin Williams. This course would occupy 1/3 of a 2-year program. It would be based on any O-level course (traditional or modern) without assuming additional maths. Since many of the topics included in the A-level course are already covered in existing texts, the committee plans to ask publishers for use of some of their material with the specification that it be used in Africa only.

The testing plans for the 1968 workshop include the review of the results of the pretesting of tests for Primary 3, Primary 5, and Secondary C-2 done during 1967-68 and possible modification of these tests for future use. New tests for Secondary C-3 will be constructed. The preparation of a syllabus and specimen examination for the A-level program will be undertaken. Serious thought should be given to a specimen Primary Leaving Examination based on the Entebbe program, with a strong possibility that such an examination will be constructed at the workshop. Finally, the examination needs of the Teacher Training Colleges should be investigated.

IV. FUTURE WORKSHOPS

The primary tasks of any workshop after 1968 will be (1) further intensive work on testing and (2) consideration of necessary revision in the text books. There was some discussion as to whether these changes could be determined by a group in the 1968 workshop, and carried out in a 1969 workshop. 1968 seems early to make changes. Revision of the primary texts may not be necessary

because the books will have been adapted by the countries before an evaluation could be made.

It is possible that an American mathematician could be engaged through AID to be associated with each country to work on adaptations to be sure that what is being written is of high quality, and follows the spirit of the program. Perhaps one or two months in residence each year followed by correspondence during the remaining months would be sufficient. One problem seems to be that regions (groups of countries) rather than single countries must qualify for this service. "Unity of purpose, but diversity of need" was suggested as satisfying the qualification.

V. EVALUATION

It seems that AID is not currently pushing for evaluation. The task is colossal. It was felt that this is not a task for this group to do, at least not alone. It would need to rely heavily on African help as well as American help outside our program. It was also felt that if an outside evaluation is made, it would be helpful if the Entebbe group could be involved in the selection of the evaluators.

ADDITIONAL COMMENTS

It was suggested that a committee be appointed to draw up an A-level syllabus.

The question of when the additional maths material would first be used (1968 or 1969) and by whom, was also asked.

The priority list for publication of this year's workshop materials was Primary 6, Primary Handbook and Additional Maths.

Professor Hardgrove reported that SRA has decided to adapt the Entebbe maths for publication in the United States. They are reproducing the program in the same style with few changes in Primary 1 and 2, but additions have been made to the Geometry in Primary 5, and the material has been reorganized to make the 5-year course cover six years. Some other changes have been made. Earlier in June of this year, Professor Hardgrove recommended that EDC decline the offer for a credit line in the SRA books, and this recommendation was followed by the chairman and by EDC.

EDUCATION DEVELOPMENT CENTER
AFRICAN MATHEMATICS PROGRAM
55 Chapel Street, Newton, Massachusetts 02160

Notes of the Meeting of the African Mathematics Steering Committee held at 9:00 a.m., Saturday, October 7, and Sunday, October 8, 1967, at Logan International Motel, Logan Airport, Boston

Present: Professor W. T. Martin (Chairman), Mr. J. L. Aldrich, Mr. H. P. Bradley, Prof. R. Davis, Professor R. Dilworth, Professor R. Dubisch, Professor J. Goldstein, Professor V. Haag, Professor C. Hardgrove, Professor S. Hill, Professor Peter Lappan, Jr., Mr. C. Modu, Professor B. J. Pettis, Professor A. L. Putnam, Professor W. Prenowitz and Professor D. E. Richmond. Visitors included Mr. G. Oakley, Jr., Mr. F. L. Ferris, Jr., and Dr. G. W. Angell, Jr. Miss Pat McNeille and Mr. John Joanou, staff members of the Program, were also in attendance.

I. REPORTS

A. Summer Workshop 1967

Primary: Professor Clarence Hardgrove reported that the elementary writing group was engaged in four main activities this summer: 1) writing Primary Six 2) writing a Teachers' Handbook I - VI 3) working with teachers at Fahari School, Mombasa 4) working closely with the Testing Group. She expected that Primary Six would be slightly larger than Primary Five. Work on the Teachers' Handbook is well advanced but needs editing. This work was accomplished even though the group had fewer members than in other years and two members had to leave the Workshop early, and the participants from Eastern Nigeria did not attend.

Secondary - Additional Mathematics: There were two main groups in Additional Mathematics: Discrete Mathematics, under Dr. Hartley Rogers, and Calculus and Mechanics, under Dr. Abbiw-Jackson. Writing subgroups responsible for chapter production and consisting of African and American participants were formed. On finishing the first draft, each subgroup had to present and defend its material before an editorial committee consisting of the two co-chairmen, a member of the writing group, and one other participant.

Most of the work has already been completed but some drafts are still under preparation. There was some discussion on the need to present an Additional Mathematics examination syllabus and a specimen paper to the West African Examination Council. As a result of changed conditions and the delay in experimentation of the materials in Ghana, this need was not now urgent. It was decided that the W.A.E.C. Registrar should be informed that the syllabus and specimen paper would be presented later. Meanwhile, Professor Lappan, Professor Dilworth and Mr. Modu will meet to review the syllabus and specimen paper before they are sent to the examining bodies.

Testing: Dr. Peter Lappan reported on the activities of the Testing Group. In accordance with plans made in the previous year, tests were written for primary and secondary materials. A Secondary C Two test was written and will be tried out in Ghana and Tanzania this fall. A test for Primary Five was

also written. Professor Hill of the Primary Writing Group worked closely with the Testing Group to put Primary Three tests into final form. These will be sent to Tanzania for trial use in six classes, and also, in December, to Ghana.

a. Secondary Selection Examination (Ghana): It was decided to write Miss Lucy Addy for permission to give the Ghanaian Primary Five classes using Entebbe materials, the 1967 Ghanaian Primary Six Leaving Examination, in order to obtain some information about how the Entebbe children face up to a traditional examination at this level. The hypothesis that the Entebbe children are ahead of their peers would be put to the test.

It was thought that finally, the Secondary Selection Examination taken by the Entebbe children would be a traditional type test but there should also be some questions which test the additional modern mathematical knowledge they have been studying.

Mr. Modu reported meeting in London with Mr. Peter Jones of the Cambridge Overseas Examination Syndicate to set O Level Examinations for Entebbe trained students in Nigeria this November at the Aiyetoro Comprehensive School and Ibadan Grammar School.

Mr. Frederick L. Ferris, Jr., Director of Research and Evaluation for EDC, together with Dr. George W. Angell, Research Associate, will be controlling the program's testing and evaluation efforts. Dr. Angell will handle the administration of secondary tests in Africa. This activity was previously done by Dr. Lappan.

B. ABC Institute

Professor B. J. Pettis, Chairman of the 1967 ABC Institute, reported on the second summer meeting held at University College, Nairobi, July 2 - 28, 1967. This summer, a new D-group, consisting of secondary teachers, was added.

In addition to lectures and tutorials, the participants also attended National Writing Group sessions to devote their attention to whatever problems they chose concerning such topics as text criticism and correction, curriculum design, organization of in-service institutes for teachers, and other problems relating to introducing modern mathematics into schools.

As was done last year, the lecturers and C participants spent two weeks, after the Institute, writing correspondence courses for the A, B and D participants. The participants were divided into national and/or regional groups, with a correspondence tutor assigned to each group. Correspondence work will continue throughout the ten months prior to the 1968 Institute.

Professor Pettis, commenting on the general success of the ABC Institute, reported that last year's participants showed definite signs of progress and should show even more by next summer. Not only have they improved their knowledge of elementary mathematics and how to regard it and teach it, but they have had their mathematical concepts and understanding widened and deepened; "not a great deal, but properly and significantly."

C. Country Institutes

Ethiopia. Professor B. J. Pettis reported on an Institute for 90 Secondary teachers sponsored by the Ministry of Education and organized by Mr. J. C. Fitzgerald and Ato Yohannes Menkir, at Haile Selassie I University, Addis Ababa, August 15 - September 1, 1967. Professors Paul Johnson and B. Pettis, EDC lecturers, were assisted by two Ethiopian mathematicians, some Peace Corps Volunteers, two Yale undergraduates and some of the Ethiopian ABC Institute participants. Ethiopia plans to introduce immediately the Secondary C One texts into all Grade Nine classes throughout the country. As a necessary step the local adaptation of the texts involve changes to the Ethiopian monetary system and measurement from feet and inches to the metric system. The texts are being published locally.

Ghana. Professor S. Hill reported on a two-week Institute for Primary Five teachers organized by Miss Lucy Addy of the Ghanaian Ministry of Education, at the University of Ghana, Legon, August 28 - September 8, 1967. Fifty-six participants consisted of Primary Five teachers, head teachers, and visitors from the Ministry. Professor Hill, the EDC lecturer, was assisted by Dr. Abbiw-Jackson. Five Peace Corps Volunteers also assisted in lectures and tutorials. Two additional courses are planned: one at Easter and another for Secondary school teachers which will be administered entirely by Africans.

Nigeria. A cable from Dr. Grace A. Williams reported that three Institutes consisting of 230 participants began September 4, 1967. (No further details are available.)

II. CREDO/EDC CONFERENCE

Mr. Gilbert Oakley, Vice President of EDC reported on the September 11, 1967 CREDO/EDC Conference at Oxford, England, to investigate the curriculum reform needs of African countries and to discuss how best CREDO and EDC can help the African Ministries of Education satisfy their needs.

III. REPORT ON THE USE OF ENTEBBE MATERIALS IN PARTICIPATING COUNTRIES

Tanzania is using both Entebbe and SMP materials at the Secondary level. The Ministry has decided to introduce Entebbe into all primary schools beginning November 1967. Entebbe texts Primary One through Four have been translated into Kiswahili. Primary Five will also be translated. There is some local pressure for a Tanzanian Secondary Mathematics Text. It was stated that the 'core' of such a text would be taken from the Entebbe books. There are 31 Secondary One and 31 Secondary Two classes presently using the Entebbe Texts.

Kenya is using the Entebbe texts in 200 classes up to Primary Five. Until now the original Entebbe text was used at each grade level for one year and in

subsequent years a Kenyan adaptation of that text was used. EDC has always felt that the adaptations were being done too quickly. Now, the Curriculum Development Centre in Nairobi also feels their adaptations have been done too soon. This summer it was decided that Entebbe should be used in its original form for at least two years before any adaptations are undertaken.

The Ministry has decided to introduce Secondary C One in 10 - 15 schools on a trial basis. This is the first time any Entebbe Secondary materials have been used in Kenya on such a scale.

Ethiopia. As was mentioned in the above report in the country institute in Ethiopia, Secondary C One will be used in all ninth grade classes throughout Ethiopia this fall. Fifteen thousand copies of the texts are being privately printed for distribution. To supplement the Teacher Training program, the Ethiopian National Television Network is preparing a series of 30-minute weekly programs on Secondary C One for the Addis Ababa area.

A translation of Primary One into Amharic is currently under way as a first step for adoption of Entebbe in all Primary One classes planned for the fall of 1969.

Uganda. Conditions at present are not good for controlled experimentation because of the lack of central control. However, under the direction of Dr. Rowland C. Anderson of T.E.E.A., the colleges are being encouraged to use, and in many places are using, the Basic Concepts Texts.

Ghana. The use of Entebbe on the primary level is proceeding very well under the direction of Miss Lucy Addy. The secondary program is about to expand. Because of a shortage of secondary teachers, the Ministry has requested assistance from the Peace Corps to introduce modern mathematics at the secondary level. It is also hoped to strengthen mathematical education in Teacher Training colleges by using Peace Corps Volunteers.

Sierra Leone is moving slowly. Despite strong recommendations for widespread use of Entebbe by the Sierra Leone Mathematics Committee, progress has been slow. However, as a result of meeting with the Department of Education and Peace Corps officials, a Peace Corps Volunteer (math major) has been assigned to the Department of Education to encourage the use of Entebbe and to assist in all mathematics programs. (A statement by the Sierra Leone Mathematics Committee is attached.)

Nigeria. Northern Nigeria has a four year teacher training program operating out of the Wisconsin group.

Due to the trouble in Nigeria information has come mostly from the North. The University of Wisconsin Teacher Training Program in seven colleges has been using the Entebbe Secondary C Texts and Basic Concepts Texts continuously and successfully. There has also been uncoordinated requests for texts from various mission schools and colleges as well as some firm requests from the Ministry. The Northern Nigerian Ministry participated fully in the ABC Institute.

The only other information from Nigeria was news of a Teacher Training Institute for 230 Lagos teachers organized by Dr. Grace A. Williams.

Liberia. Although Education Secretary Caine voiced strong approval of introducing new mathematics universally, the Liberians are moving cautiously. Entebbe math supervisor, PCV John Norris, and his replacement, Don Perardi, have been very active in up-country schools and teacher-training colleges running workshops, vacation schools and seminars, and distributing Entebbe books.

Mr. Richard Hailer, Assistant Director of Peace Corps, has proposed a plan which calls for seven teams of PCVs, each team having four members: one math major, one science major and two physical education instructors. These 'circuit riders' would travel by jeep to up-country schools and colleges to assist in in-service training.

Dr. Baker, President of Cuttington College, voiced interest in the trial use of Additional Mathematics at the College.

The Ministry has selected a site for a Science Center and will appoint a science educator.

Malawi. The Ministry has decided to introduce modern math in all schools beginning with Primary One. The Primary program is expanding and an adapted test is about to be produced by the Chief Education Officer (designate) and Mr. Frank Kazembe. Malawi is planning to use SMP on the Secondary level. An ABC participant, Mr. David St. John-Jesson, who feels SMP is not suitable, tried unsuccessfully to persuade the Ministry to use Entebbe.

Zambia. Entebbe will be one of four math programs to be used on the Secondary level in Zambia. A Teacher-Training Institute to introduce teachers to this experiment has been planned for January 1968.

Conclusion. It seems clear that most African countries are going to adopt the Entebbe materials and some are going to do this without adequate mathematical help. Consideration should be given to the steps which must be taken to ensure sufficient competent supervision and to maintain adequate standards.

IV. PUBLICATIONS

1966 Workshop. Primary Five is ready and being shipped, Secondary Five is due October 13, Secondary C Three Geometry will be ready before October 31.

1967 Workshop. The main work of Primary Six and the Primary Teachers' Handbook I-VI has been completed.

Dr. Abbiw-Jackson and Dr. Hartley Rogers have sent in an outline of 20 chapters of the Additional Mathematics text. The MS is expected to be in the hands of the editors by October 15.

Demand and Supply. The general inventory of Entebbe texts is satisfactory. Standing orders for new publications follow:

| | |
|----------------------------|---------------|
| Primary Five | 12,000 copies |
| Secondary Five | 6,000 copies |
| Secondary C Three Geometry | 5,500 copies |

Several requests in large numbers for Basic Concepts Volumes I - IV have been received in the last six weeks.

Books Phased Out. The Primary One texts were phased out in December 1966. Primary Two, Secondary One and Basic Concepts Volume I will be phased out in December 1967. Commercial editions of the texts have been prepared and are available from SRA, Ltd., England, as follows:

| | |
|-------------|--|
| Primary One | Pupil Book |
| Primary One | Teachers' Guide |
| Primary Two | Pupil Book (Volumes 1 and 2 in one volume) |

Secondary C One Algebra - Student Text
Secondary C One Geometry - Student Text
(available October 1967)

Basic Concepts Vol. I and II Revised Edition
(available November 1967)

Reprinting Schedule. Negotiations are currently underway for a reprinting of the following:

- a) Secondary Three Algebra to be Secondary C Two Algebra with new covers and front matter,
- b) Secondary Four Algebra to be Secondary C Three Algebra with new covers and front matter,
- c) Secondary Five to be Secondary C Four with new covers and front matter.

Copyright. There was considerable discussion of the copyright conditions under which the program operates. Mr. Oakley agreed to see if these conditions could be changed. Independent of this action by Mr. Oakley, it was agreed that the American members of the Executive Committee (Professors Dilworth, Martin and Prenowitz), plus Professor Hardgrove, would serve as a committee to consider any matter in relation to the copyright.

V. PLANS FOR EVALUATION

Dr. R. Dilworth reported that the need for evaluation still exists though it could be done on a smaller scale than originally planned. There is still a strong need for instruments to measure mental maturity. Other phases of the original plan for evaluation could be modified: Phase A. - determining socio-economic and teacher variables. This phase cannot be cut down, except perhaps on personnel (to 3 or 4).

Phase B. - Teams will need to go into three areas. The extent of testing could be cut by selecting sample groups. A team of three or four is still required in each region and a period of at least five weeks per area.

Phase C. - Statistical analysis, interpretation of ideas and writing reports. Four people will be required for a minimum of four months.

It was suggested that an independent body be set up to do an evaluation of all math programs, as this would be the only type of evaluation meaningful to the Ministries of Education. However, given its goals, the evaluation proposed by the EDC group would actually be of broad use. The instruments contemplated, for example, the one to measure mental maturity, could be of benefit to anyone.

It was suggested that the African Mathematics Program cooperate with the African Elementary Science Program on this project to avoid duplication of effort.

Discussion followed the Chairman's question to the Steering Committee as to whether it feels this to be a worthwhile undertaking, and if so, how to go about it. The purpose of the evaluation would be to see if Entebbe students were doing as well as we think they should be in acquiring skills and in problem solving. One way to go about project would be to have the EDC research group under Dr. Angell visit the African universities and suggest cooperation in areas outlined in Professor Dilworth's proposal. This would help to establish more continuous control from Africa.

It was decided by the Committee that work on this project should proceed along lines already established. EDC will try to secure funds, and a working committee of four (Dilworth, Kagan, Hill and Modu) will attempt to at least implement Phase A and go as far as possible in it, keeping in touch with the African Education Program.

VI. AID RELATIONSHIPS

A. Status of Current Proposal. A new amendment is to be submitted for the period November 1, 1967 - December 31, 1968. It was asked that we reduce our budget by one-sixth. With this reduction we can keep activities going on same basis, but cannot give as much support to country institutes as in the past.

B. Long-term Planning: We are at a stage of change of emphasis in our activities. Thus there is a problem of how to present our case to Washington. We need a broader approach to the activities of the program and must devise an overall plan based on two considerations; a) What sort of activities should we ask RES to continue supporting in regard to the experimental aspect of the program; b) How must we deal with the problem of adaptation, proliferation, teacher training, cost of books, etc.

a) Need was determined for support of the following projects:

1. Testing activities:

1969 - Design stage of final tests on Primary (to include School Leaving Exam) and Secondary

1970 - Pretesting and assembling of tests into final forms

1971 - Writing of additional comprehensive tests. (Since this might be an activity for a branch of the examination councils, it was suggested that the testing group start moving into closer relations with Councils, with an eye to '71.)

2. Writing projects: Plans for 1969 include rewriting Secondary C One preparing guides for adaptation and writing a "link book" for bridging the primary and secondary levels. The need for a Workshop in Africa for these activities was questioned. It was suggested that work could be done in small groups at individual meetings. We would seek financial support to enable African mathematicians to assist with the proposed writing tasks.

b) Need was determined for financial support from AID for more wide-range projects:

1. Adaptation. We would need funding for substantial work, for example, a serious survey on what changes need to be made in the books. Since there is only limited manpower, we would have to decide if changes are minor or major to determine whether they would require a workshop type of activity.
2. Proliferation. This would be a new phase of operation which would require financial support. Country-wide proliferation, carried out through the teacher training programs, would be a 10-year operation for which the African countries do not have the money. Particularly, there is need for financing to make up the differential between buying the required books and buying those they would normally buy.
3. Teacher Training. It was noted that the African countries all feel they need at least the type of support which would be given by having a mathematician familiar with the program, to work with them on a part-residence/part-correspondence basis. Financial support would be needed to enable mathematicians to help in Africa with this sort of work.

It was suggested that perhaps the best way to deal with all of these wide-range projects is to set up regional centers, at which there would be a mathematician-in-residence. From such centers, we could maintain our contacts and the counterpart ideal could fit in well. EDC would act as liaison to make suggestions and supply names. It was suggested that a pilot project of this type be set up.

VII. ACTIVITIES FOR 1967/68

A. Workshop.

Primary work will consist of arranging the primary I - VI material so that it could also be used in a 7 or 8 year program, and of determining what additional work requires to be done by someone completing the six-year course in order to enter Secondary C Two. The Primary Writing group will require about eight people.

Secondary (Advanced Mathematics) work will consist of writing a two-year program, requiring about one third of the student's time, for those who have completed any O level mathematics course. About eighteen people will be needed for the Advanced Mathematics Writing Group. It was decided that before the Executive Committee meeting in the spring, Dr. Awadagin Williams, Dr. Abbiw-Jackson and Professor Hartley Rogers should meet and/or correspond to make more definite plans for writing the texts. More connecting remarks, philosophy and detail are needed in order to provide for flexibility in topics. It is hoped that the Examination Councils, which may require two syllabi, would accept a single, flexible syllabus.

Testing will: a) prepare tests for Secondary C Three, an A level syllabus and specimen exam, and review tests of the Secondary program; b) put Primary 3 tests into final form and prepare a specimen exam for the end of primary (Primary Leaving Exam) based on Entebbe; c) also try to consider the needs of the teacher training colleges, as there has been a demand for some kind of testing program on material produced for the training colleges by Entebbe. The testing group will have about twelve people.

B. ABC Sourcebook. It was noted that, at the ABC Institute, not much material was produced for the proposed Sourcebook. A review of the existing material would be required to determine if what is available can be made into a Sourcebook. There is a definite need for this type of book since it would help teachers in solving mathematical problems and provide guidelines for setting up and running teacher training institutes at the local level. It was decided that one or two Steering Committee members should determine if a sourcebook could be created out of the existing material.

C. Films. The Ghanaian Film Industry Corporation in Accra has full facilities for film making and is enthusiastic about working on the EDC film project. EDC is awaiting details of their technical equipment before getting on with plans. We are hoping to have a pilot film within two to three months. Presently money is available for two films. If they are successful we will seek more funds for additional films.

D. ABC Nairobi Meeting 1968. This meeting will be strictly functional dealing entirely with primary teacher education - a knitting together of the two previous summer meetings and correspondence work. It is planned to bring to Nairobi those A, B, and C participants (i.e., those involved in teacher training) to show them the Sourcebook, the Primary Handbook, films, and to give them a certificate of completion. The meeting will last about ten days, and will have as participants only those who have completed their correspondence work.

E. Country Institutes. Twenty-six country institutes are being planned for 1967/1968 and will require about twenty visiting lecturers. Members of the Steering Committee were asked to inform Mr. H.P. Bradley if they would be available for any of these institutes.

VIII. RECRUITING OF PERSONNEL

A preliminary list of possible participants for 1968 was submitted and discussed.

The meeting adjourned at 3:30 p.m. on Sunday.

REPORT ON EXPERIMENTAL TESTING, FALL 1966

During the fall of 1966 a test entitled 'The Secondary One Experimental Mathematics Test' was taken by 1062 pupils in Tanzania. Of these, 353 were from classes which had studied the Entebbe Secondary C One Mathematics text, 357 were from classes which had studied the Secondary One course of the Southampton Mathematics Project (SMP), and 352 were from classes which had followed a more traditional mathematics course. (In the following paragraphs, the groups will be referred to as "Entebbe," "SMP," and "Standard.")

The classes which were examined were carefully chosen by the Tanzania Ministry of Education to be matched among the three groups as evenly as possible in ability and training, as well as in all other details for which existing records would make such matching meaningful.

The test itself is a 40 question multiple choice test, with 5 options to each question. It is designed to measure a broad range of skills and concepts usually taught in Secondary One Mathematics Courses in Africa - including both modern and the more traditional courses of study. Although every attempt was made to avoid building into the test a bias caused by a choice of wording or notation, it is recognized that such biases could be present. Also, it is probable that not all classes even within a given group covered all the topics tested, thus giving the test an additional, but unmeasurable bias.

The average scores for the three groups were:

| <u>Group</u> | <u>Average Score</u> | <u>No. of pupils</u> |
|--------------|----------------------|----------------------|
| Entebbe | 18.42 | 283 |
| SMP | 17.05 | 214 |
| Standard | 18.68 | 281 |

(The scores given above are average number correct with a possible score

of 40. Due to a mix up in the scoring, 70 Entebbe pupils, 143 SMP pupils, and 71 Standard pupils were not counted in these totals. The scores for these pupils are given in the appendix to this report. It should be noted that in all cases, had these scores been incorporated in the group scores above, the scores for each group would have been slightly lower.)

When the method of selection is considered, the relatively small difference in the total scores seems insignificant. That the SMP score is somewhat lower than the other two should not be taken too seriously although a follow-up study of the reasons might be of great value. Of greater importance is the question-by-question performance of the various groups. Rather than fill pages and pages with statistics, we will content ourselves to speak in generalities here and merely indicate where in the appendix the appropriate statistical data can be found.

The Standard group had the best performance on the more traditional material. For example, it scored best on the questions involving the straightforward solution of equations (questions #20, 31, and 38) and also on those problems involving the complete solution of story problems (#21, 26, and 28). The standard group also did better than the others on such topics as location of the decimal point (#6 and 36) and percentage (#22 and 26). In addition, the standard group did much better than the other two on the questions involving Geometry (#8, 9, 13, 17, 32, 34, and 39). In most cases, the margin of superiority was relatively small, and to a certain extent is a reflection of the amount of time devoted to these topics.

In the more modern topics, the Entebbe and SMP groups performed better than the Standard group. The Entebbe group scored best on those questions involving inequalities (#3, 15, 23, 29), the number line (#1 and 11), proper-

ties of number operations (#2 and 14), and SMP showed more knowledge of special properties of numbers (#7, 12, 15, 30, and 33). Despite the fact that the Standard group had the best performance on story problems, the Entebbe group did better than the other two on questions involving setting up the equation which would solve the story problem (#10 and 35). Here again the results are not surprising when the emphasis of the programs are considered.

It is to be noted that this test reflects performance after only one year of a four year course. To this extent it is not fair or meaningful to make a judgement about the value of the four year course as a result of this testing. But the following judgments seem to be in order.

1. Each of the three programs involved seems to be teaching the pupils a sufficient amount of mathematics. It is not possible on the basis of this one test to determine the role of the teacher, the text, or the motivation and ability of the pupil in this learning process. However, it is evident that the variety of mathematics a pupil will know and the extent to which he will have mastered individual components of that variety is greatly influenced by the emphases and priorities given by the text.

2. Although the general level of performance on this test was satisfactory by many standards, many of the skills and concepts of basic mathematics are not being mastered by as large a percentage of the pupils as could be hoped. Obviously, the strong points of each of the programs involved have something to offer to the other two.

3. With specific reference to the Entebbe program (and SMP, too, for that matter), the basic algebraic skills and their relation to story problems do not seem to have been given sufficient emphasis. That the teachers and text should spend proportionately more time on the more novel aspects of

the program is not surprising. However, the need for more practice with the routine skills of algebra must be brought to the attention of the teachers in a form which will help overcome the temptation to cut short the more traditional in order to spend more time with the less conventional content of the course.

APPENDIX I
Item Analysis

| QUESTION NO. | ENTEBBE | | SMP | | STANDARD | |
|--------------|---------|-----|-----|-----|----------|-----|
| | f | r | f | r | f | r |
| 1 | .54 | .48 | .57 | .43 | .44 | .56 |
| 2 | .91 | .52 | .75 | .33 | .85 | .61 |
| 3 | .79 | .42 | .68 | .59 | .64 | .51 |
| 4 | .73 | .20 | .82 | .40 | .75 | .21 |
| 5 | .86 | .22 | .83 | .47 | .80 | .26 |
| 6 | .81 | .31 | .80 | .38 | .81 | .41 |
| 7 | .69 | .34 | .76 | .40 | .62 | .37 |
| 8 | .71 | .60 | .78 | .47 | .84 | .44 |
| 9 | .46 | .37 | .46 | .50 | .45 | .41 |
| 10 | .77 | .50 | .62 | .52 | .72 | .57 |
| 11 | .72 | .49 | .48 | .31 | .58 | .31 |
| 12 | .42 | .36 | .40 | .47 | .32 | .45 |
| 13 | .57 | .42 | .57 | .35 | .72 | .64 |
| 14 | .43 | .21 | .33 | .06 | .45 | .30 |
| 15 | .52 | .32 | .54 | .27 | .44 | .42 |
| 16 | .57 | .22 | .55 | .42 | .53 | .31 |
| 17 | .60 | .57 | .62 | .47 | .70 | .49 |
| 18 | .49 | .49 | .50 | .42 | .54 | .55 |
| 19 | .37 | .50 | .25 | .48 | .12 | .54 |
| 20 | .64 | .47 | .58 | .59 | .78 | .58 |
| 21 | .30 | .46 | .34 | .51 | .37 | .44 |
| 22 | .41 | .34 | .26 | .43 | .44 | .40 |
| 23 | .40 | .47 | .40 | .38 | .41 | .50 |
| 24 | .36 | .20 | .36 | .22 | .42 | .24 |
| 25 | .43 | .56 | .32 | .62 | .40 | .51 |
| 26 | .49 | .46 | .34 | .48 | .54 | .58 |
| 27 | .26 | .35 | .25 | .47 | .24 | .51 |
| 28 | .22 | .45 | .22 | .40 | .39 | .52 |
| 29 | .22 | .59 | .18 | .44 | .15 | .44 |
| 30 | .24 | .24 | .31 | .36 | .28 | .26 |
| 31 | .36 | .51 | .41 | .53 | .60 | .50 |
| 32 | .43 | .40 | .49 | .40 | .47 | .35 |
| 33 | .29 | .39 | .38 | .33 | .36 | .47 |
| 34 | .23 | .55 | .26 | .41 | .30 | .58 |
| 35 | .21 | .39 | .14 | .16 | .14 | .45 |
| 36 | .31 | .50 | .38 | .32 | .46 | .35 |
| 37 | .29 | .33 | .27 | .25 | .20 | .15 |
| 38 | .27 | .60 | .11 | .35 | .28 | .46 |
| 39 | .20 | .20 | .18 | .32 | .27 | .45 |
| 40 | .28 | .41 | .20 | .31 | .39 | .33 |

In the table above, f represents the percentage of the pupils in each group who answered the question correctly. The r -biserial is denoted by r . The r -biserial is a measure of the correlation of performance on the question with overall performance on the test. In each case, the r -biserial shown is based on the performance of each group, and does not reflect the total performance of the three groups.

APPENDIX II

Performance of those pupils taking the test but not counted in the totals shown above

| Group | Average Score | Number of pupils |
|----------|---------------|------------------|
| Entebbe | 16.69 | 70 |
| SMP | 14.43 | 143 |
| Standard | 15.77 | 71 |

(Scores are given on the same basis as in the table on page 2. It is to be emphasized that the results of these pupils were omitted from the totals considered due to a clerical error made during the scoring. It is doubtful if the incorporation of these scores into the statistics in Appendix I would have made any significant difference in any of the figures.)

APPENDIX III

Sample Questions and Item Analysis

In this section we present nine of the questions appearing on the test together with a portion of the item analysis. These particular questions were selected both to give the flavor of the actual test and to give some depth to some of the more interesting differences in performance of the various groups as given in Appendix I. This selection is not intended to prove or disprove any particular statement given in the body of this report.

Question No. 2

If $5 \times (4 + (?)) = (5 \times 4) + (5 \times ?)$, find the missing number.

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

| GROUP | N | A | B | C | D | E | O | P |
|----------|-----|----|---|-----|---|----|----|-----|
| Entebbe | 283 | 3 | 1 | 257 | 2 | 7 | 12 | .91 |
| SMP | 213 | 10 | 7 | 160 | 4 | 13 | 19 | .75 |
| Standard | 281 | 2 | 3 | 238 | 3 | 12 | 23 | .85 |

Correct Answer: C

Question No. 3

Find the largest whole number x such that $3x$ is less than 11.

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 10

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|---|---|-----|----|----|----|-----|
| Entebbe | 283 | 2 | 5 | 223 | 10 | 22 | 21 | .79 |
| SMP | 213 | 6 | 5 | 144 | 3 | 22 | 33 | .68 |
| Standard | 281 | 6 | 6 | 180 | 11 | 22 | 56 | .64 |

Correct Answer: C

Question No. 8

The volume of a room is 10,000 cubic feet. If the height and the length of the room are 10 feet and 40 feet, respectively, what is the width of the room in feet?

- (A) 2.5 (B) 25 (C) 250 (D) 450 (E) 4000

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|----|-----|----|---|----|----|-----|
| Entebbe | 283 | 19 | 201 | 12 | 7 | 11 | 33 | .71 |
| SMP | 213 | 11 | 166 | 11 | 5 | 4 | 16 | .78 |
| Standard | 281 | 7 | 235 | 8 | 7 | 4 | 20 | .84 |

Correct Answer: B

Question No. 10

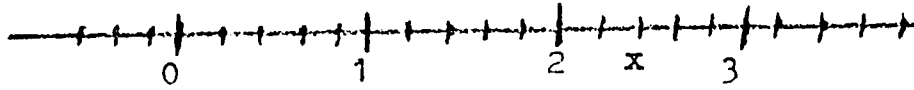
Isaac is 3 years older than Mary, and the sum of their ages is 33 years. Which of the following equations will help in finding Mary's age?

- (A) $(x + 3) + x = 33$
(B) $(x + x) + x = 33$
(C) $x + x = 33 + 3$
(D) $x + 3 = 33$
(E) $2x + x = 33 + 3$

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|-----|---|----|----|---|----|-----|
| Entebbe | 283 | 218 | 7 | 4 | 38 | 8 | 8 | .77 |
| SMP | 213 | 131 | 8 | 16 | 36 | 8 | 14 | .62 |
| Standard | 281 | 203 | 7 | 16 | 23 | 9 | 23 | .72 |

Correct Answer: A

Question No. 11



The point labeled x on the number line above is

- (A) $\frac{5}{12}$ (B) $\frac{2}{5}$ (C) $\frac{7}{5}$ (D) $\frac{12}{5}$ (E) $\frac{22}{5}$

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|----|----|----|-----|----|----|-----|
| Entebbe | 283 | 2 | 41 | 21 | 203 | 7 | 9 | .72 |
| SMP | 213 | 8 | 60 | 9 | 103 | 9 | 24 | .48 |
| Standard | 281 | 12 | 51 | 11 | 162 | 12 | 33 | .58 |

Correct Answer: D

Question No. 20

Solve the equation: $\frac{x}{7} = \frac{52}{91}$

- (A) 2 (B) 3 (C) 4 (D) 5 (E) 13

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|---|---|-----|---|----|----|-----|
| Entebbe | 283 | 4 | 2 | 181 | 7 | 52 | 37 | .64 |
| SMP | 212 | 1 | 2 | 122 | 8 | 41 | 38 | .58 |
| Standard | 281 | 2 | 8 | 219 | 6 | 25 | 21 | .78 |

Correct Answer: C

Question No. 28

The ratio of the number of girls to boys in an algebra class is $\frac{1}{3}$. If there are 40 students, how many are boys?

- (A) 10 (B) 13 (C) 27 (D) 30 (E) 33

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|----|----|----|-----|----|----|-----|
| Entebbe | 279 | 11 | 47 | 96 | 61 | 10 | 54 | .22 |
| SMP | 200 | 6 | 29 | 60 | 43 | 11 | 51 | .22 |
| Standard | 275 | 17 | 32 | 59 | 106 | 6 | 55 | .39 |

Correct Answer: D

Question No. 36

If $17.86 \div 0.38 = 47$, then $0.1786 \div 0.038$ is

- (A) 47 (B) 4.7 (C) 0.047 (D) 0.0047 (E) 0.00047

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|----|-----|----|----|----|----|-----|
| Entebbe | 245 | 20 | 75 | 67 | 24 | 18 | 41 | .31 |
| SMP | 167 | 14 | 64 | 27 | 20 | 4 | 38 | .38 |
| Standard | 237 | 17 | 110 | 42 | 14 | 12 | 42 | .46 |

Correct Answer: B

Question No. 38

Solve the equation:

$$\frac{7}{3} - \frac{3x}{5} = \frac{25}{6}$$

- (A) $-\frac{5}{6}$ (B) $\frac{5}{6}$ (C) $-\frac{35}{18}$ (D) $\frac{35}{18}$ (E) $\frac{8}{3}$

| GROUP | NT | A | B | C | D | E | O | P |
|----------|-----|----|----|----|----|----|----|-----|
| Entebbe | 220 | 60 | 45 | 21 | 16 | 15 | 63 | .27 |
| SMP | 149 | 16 | 28 | 17 | 15 | 15 | 58 | .11 |
| Standard | 216 | 61 | 54 | 23 | 17 | 8 | 53 | .28 |

Correct Answer: A

In the statistics given in this appendix, NT is the number of pupils responding to this question or to some later question, A, B, C, D, and E are the number responding to each of these answer options, O is the number of pupils who did not respond to this question but did respond to some later question, and P gives the percent of the pupils who answered the question correctly.

TEACHER-TRAINING INSTITUTES

APPENDIX D

Summary: Report by Professor Paul Johnson on the Teacher-Training Institute
at University College in Dar es Salaam, Tanzania
December 29, 1966 - January 11, 1967

A. Purposes of the Institute

The purposes of the Institute were: 1) to give an exposure in advanced mathematical ideas to people who otherwise would never have any occasion to run into them; 2) to bring the mathematicians of Tanzania together to discuss common problems and to allow easy contact with the University and the Ministry; 3) to furnish some discussion of the SMP and EDC programs for people who will be teaching it; 4) to prepare materials for upgrading the lowest grade primary teachers.

B. Participants

There were seventy participants from all over Tanzania, with approximately the same number of persons from Entebbe and SMP schools and a substantial number who had hopes of teaching modern mathematics but were not yet doing so. There were a large number of Grade A teachers, a number with University degrees, about a third African, a third Asian and a third European.

C. Program

The schedule included morning lectures, afternoon and evening discussions. The lecture topics were Algebra, Transformation Geometry, Computing, Topology, Analytic Geometry, Matrices, Analysis, Finite Geometries and Axiom Systems. In the afternoon small sessions were held where SMP Books 1 and 2, and EDC Secondary C One and EDC Secondary C Two were discussed. Tutors from teacher-training colleges met to prepare correspondence course work for the lowest grade primary teachers. By and large people attended the same small group throughout, chosen according to their teaching assignments. There was varying success in these discussions due to the range of backgrounds of the participants.

D. Revision of Books

There is much talk about revision of the books. In my opinion the main motives for revising the materials are: 1) the Ministry basically wants only one mathematics program in the country; 2) they feel the material should be useful (i.e., handling of money, using mathematics for making decisions, such as buying fertilizer, etc.); 3) there is a real need for people to see that the material is relevant to Tanzania. A revision, whether done co-operatively and internationally through EDC or locally with Ministry and Tanzanian Publishing Company promotion, would make this possible.

I suggested that what was needed was a set of good exercises showing the value of mathematics in the Tanzanian society. I also urged that general revisions and rewriting be done on a wider scale than one country only. I urged that their first steps be the preparation of a supplemental problem booklet.

E. General Comments

The current staff is trying very hard to meet the demands of a difficult situation. There are many sincere, hard-working, dedicated people tackling the problems, with an amazing minimum of complaint. The University, and to a smaller extent the secondary schools, are doing their best to satisfy the Ministry's desire to give the people a mathematics education for the future.

Summary: Report by Professor Vincent Haag on the Teacher-Training
Institute at Mid-Western Technical College in Auchu, Nigeria
January 3 - 14, 1967

A. Purposes of the Institute

The purposes of the Mid-Western Nigeria Mathematics Institute were to train a corps of primary teachers in seventeen schools in three districts of the Mid-Western Region to begin Entebbe One in their classes next term and to orient the secondary teachers in the Entebbe secondary program preparatory to its adoption in a few schools.

B. Participants

There were 38 primary teachers, 8 inspectors, 6 tutors in training colleges and 10 secondary teachers.

C. Program

Dr. Grace A. Williams lectured for the most part to the primary group and Professor Vincent Haag for the most part to the secondary group. Each lecturer led the secondary seminar at various times and supervised the three primary tutorial groups. Collateral reading was assigned in the Teachers Handbook and Basic Concepts I for the primary group and in Secondary C One and Basic Concepts II, III, and IV for the secondary group. There were demonstration lessons given by participants in tutorial groups and plenary sessions for discussion of future plans.

D. Reactions of Participants

The primary teachers and inspectors seemed unanimously enthusiastic and receptive. Three local ABC people attended. Their major lecturer, Dr. Williams, a fellow Mid-Westerner and a forceful and articulate person, undoubtedly played a major role in creating this attitude. It was heartening to see one situation precisely as hoped for in EDC's African projects; namely, a solid teacher-training program handled effectively and entirely by local Africans.

Although the secondary teachers were less enthusiastic and fewer of them attended, near the end of the course some of them began to react favorably to the new approach to mathematics.

E. Recommendations to the Ministry by the Institute

The participants were gratified by the Ministry's warm support of the Entebbe program. Mr. Edgal, Chief Inspector, virtually endorsed all of their recommendations for: 1) advancement of the course with increased participation by the Ministry; 2) gradual expansion of the program to all levels (primary, secondary and teacher-training); 3) more funds for books; 4) requiring future Institute participants to be practising mathematics teachers; and 5) holding future Institutes during second term holidays rather than in January, when the General Certificate Examinations are held and many teachers are unable to attend.

F. Appraisal

The primary portion of the Institute was successful proof that the objectives of the EDC African program can be met. Here was an example of a local mathematician and educator (Dr. Grace Williams) organizing and conducting a teacher-training institute with the help of local tutors (the ABC people). Dr. Williams' idea that a pilot program would have better chances of success than a program involving many scattered schools proved sound. Her gearing the Institute to the specific objective of learning to teach Entebbe Primary One also proved effective.

The ABC tutors were very competent. It was evident that their experiences in the ABC program in Nairobi last summer made the difference, and that the whole concept of the ABC program has already begun to pay dividends.

(For Full Report by Professor Vincent Haag see Progress Report to the Agency for International Development submitted January 31, 1967)

Summary: Report by Professor Donald E. Richmond on the Teacher-Training Institute at Blantyre Secondary School, Blantyre, Malawi
January 9 - 20, 1967

A. Participants

There were 53 participants: 3 District Inspectors of Schools, 4 Headmasters, 10 Tutors and 36 Teachers from Standard 1 - Standard 4.

Two of these teachers had used Entebbe texts for 3 years, seven for 2 years and three for 1 year. The texts had been used by two District Inspectors for 1, 2 and 3 years respectively, and by two tutors for one year each. Favorable experience with these texts contributed greatly to the success of the Institute since we had so many cheerleaders in the audience. I was greatly impressed by the good work that Mr. Frank Kazembe, Chief Inspector of Schools, had done in building up experience and enthusiasm over the past three years.

B. Visitors

The Institute was greatly honored by the visit of the Hon. Minister of Education, Mr. Alec M. Nyasulu, who spent a long time talking individually to the participants during the practical period. He was accompanied by the Chief Inspector and Assistant Chief Inspector of Schools, Mr. R. W. Fiddes and Mr. L. B. Mallunga respectively, and by a number of pressmen who later interviewed Mr. Kazembe and Mr. Richmond. Other important visitors were the Secretary for Education, Mr. Wareham, the Education Advisor to AID, Dr. Konvalinka, and many other Ministry officials.

C. Program

Each morning there was a lecture by Professor Richmond on topics from Basic Concepts Volume I and on Geometry, followed by group discussions based on Primary One, Two, Three and Four) and supervised exercises from Basic Concepts.

In the afternoon participants were divided into four groups for practical work, including construction of equipment for use in their respective classes. Another lecture by Professor Richmond followed. In addition, the British Council Office and the U.S. Information Service gave a series of film showings both mathematical and general.

D. Appraisal

One of the most successful aspects of the Institute was the practical work planned by Mr. Kazembe, who had prepared lists of equipment needed for Primary One, Two, Three and Four, with detailed references to the texts. This work created great interest and each participant prepared a complete set to take home. The better samples constructed were placed on exhibit as were students' notebooks and Entebbe texts. These exhibits made a considerable impression upon our visitors.

Interest remained high throughout the Institute. Participants worked very hard, often making equipment after regular working hours. The most difficult idea to get across is that the texts should not be followed rigidly and that flexibility is desirable. I have great hopes for the success of our texts in Standards I and II, where general use has now been authorized. Altogether, the Institute was most enjoyable and fruitful.

Summary: Report of the Entebbe Mathematics Seminar for Peace Corps
Volunteers Held at the Center for Continuing Education, Nsukka, Eastern Nigeria
January 15 - 17, 1967
by Professor Paul Johnson

A. Purpose of the Seminar

The purpose of the seminar was to introduce to the Entebbe texts a small group of Peace Corps Volunteers who are being appointed to teach new mathematics in Eastern Nigerian schools.

B. Participants

The participants included fourteen Peace Corps Volunteers and two staff: Dr. Onyerisara Ukeje, Acting Head, Department of Education, University of Nigeria, Nsukka, and Dr. Richard Mastain, Peace Corps Educational Director.

C. Program

Dr. Ukeje and Professor Johnson made preliminary statements to help orient the group. Then the Peace Corps Volunteers were assigned in groups of twos and threes to plan lessons for each chapter, with Professor Johnson's assistance.

Summary: Report by Professor Paul Johnson on His Visit to the
Vacation Schools for Teachers in Liberia, January 18 - February 5, 1967

A. Purpose

The purpose of the visit was to assist at institutes held at principal centers where teachers and trainers of future mathematics teachers were in attendance.

B. Program

In his two-week visit Professor Johnson spent a few days assisting tutors in each of the following institutes: Monrovia Demonstration School, Kakata Teacher-Training College, and Gbarnga, Ganta and St. Teresa.

Each institute was six weeks long with a program devoted to four classes daily, usually one each in science method, science content, math method, and math content. Professor Johnson lectured to the classes in math content and method. All the participants were elementary school teachers. The classes were organized according to the level of achievement of the teacher, not according to the material taught.

C. Questions of the Participants

Among the most common questions asked were the following:

- 1) How does modern mathematics differ from old mathematics?
- 2) Can a program developed in America be used in Africa?
- 3) Because of the limited background of our teachers, won't modern mathematics confuse them?
- 4) We teachers need help. Will there be a program of courses to help us learn and teach modern mathematics?

D. Recommendations by Participants

The following are a few suggestions Mr. Johnson encountered in the various institutes:

- 1) A program of mathematics curriculum agents or math-science curriculum agents should be started. Initially Peace Corps Volunteers would be the agents, with Liberians replacing them as rapidly as possible. An agent would be responsible for working with a group of schools and their teachers.
- 2) Vacation School should be changed in pattern to include two courses; the first for instructors, and the second for teachers.
- 3) A program of salary credits could be tied to in-service training.
- 4) A program of extension courses might be taught once or twice a week.

E. General Comments

As in other African countries and the U.S., teacher-training in Liberia offers the most profitable and rewarding path to improved education.

Summary: Report by Mr. Dyck-Harding of the Teacher-Training Institute
at Milton Margai Training College, Goderich, Sierra Leone
March 28 - April 8, 1967

A. Organization

The Institute held at Goderich for primary school teachers was organized, staffed and directed entirely by Sierra Leoneans without the aid of U.S. lecturers. Dr. Awadagin Williams of Fourah Bay College and Mr. F. E. Dyck-Harding of Milton Margai Training College were the principal organizers.

B. Participants

Thirty-five primary school teachers and several members of the Inspectorate staff of the Ministry of Education were in attendance. The teachers were divided into three groups as follows:

- 1) teachers doing the course for the first time. Dr. Williams and Miss Florence C. Hedd were in charge of this 'beginner' group;
- 2) teachers who did the course last year for the first time. Mr. Dyck-Harding and Mrs. Margaret Greene worked with these teachers;
- 3) teachers who had attended two or more similar institutes in Sierra Leone in previous years. Dr. John Simbo and Mr. Julius Jonah met with this group.

C. Program

Lectures on numbers and geometry were given each morning and afternoon until 3:30 p.m., with coffee break from 10:30 to 11:00 a.m., and lunch from 12:30 to 1:30 p.m. The opening ceremony was chaired by Reverend C. E. Tuboku-Metzger, Acting Principal of Freetown Teachers College. In addition to the lectures, demonstration lessons were given by Mrs. Olive Benjamin of the Tower Hill Municipal School.

D. Evaluation

The participants were asked to give an estimation of the course. They commented that: 1) they would prefer devoting the mornings to lecture and the afternoons to tutorials and apparatus making; 2) they would need more demonstration lessons; 3) primary texts should be brightly colored; 4) they inquired about how soon the Entebbe text would be introduced into all schools.

The Institute was considered beneficial to all. The organization of participants into three groups enabled each group to proceed at its own rate. The "beginners" were enthusiastic about the new mathematics. The second and third group participants felt they deepened their understanding of new mathematics and expressed their confidence in the Entebbe material.

The Institute was successful proof that one objective of the EDC African program can be met: local mathematicians and educators organized and conducted a course to train local teachers in the modern mathematics.

Summary: Report by Professor Roy Dubisch on the Teacher-Training Institute at the National Institute of Education, Makerere University College, Kampala, Uganda, April 17 - 22, 1967

A. Participants

About seventy students attended, divided fairly equally between Assistant Education Officers, demonstration school teachers, and teacher-training college tutors.

B. Program

Professor Dubisch lectured from 8:30 to 9:30 and 2:00 to 3:00 each day. There was supervised study (by groups) from 9:30 to 10:30, study and discussion from 11:00 to 12:30, and a question and discussion session for the entire group from 3:00 to 4:00.

C. Lectures

Because of limited time and the variety of the group, Professor Dubisch spoke in a 'practical' fashion rather than start at the beginning of Basic Concepts. He then discussed the concept of a base, sets, etc., as the need for these ideas became evident. This approach proved to be quite successful. In this way an over-all survey of Volume I of Basic Concepts was made.

D. General Comments

During the course the students spent some time examining various materials, including the Entebbe texts. They also saw Primary One of the new Uganda (Okello) series. This is certainly 'modern' in its general approach but deviates substantially from our Primary One.

I found to my satisfaction that my students were more responsive, asked more questions, and took less on authority than was the case three years ago.

Summary: Reports by Professor Paul Johnson and Professor B. J. Pettis
on the Teacher-Training Institute at Haile Selassie I University
Addis Ababa, Ethiopia
August 15 - September 1, 1967

A. Purpose of the Institute

This Institute was held to give selected teachers an introduction to Entebbe Secondary C One Algebra and Geometry, which is being adopted in all ninth grade classes throughout Ethiopia.

B. Participants

All Ethiopian Teacher-Training Institutes and nearly all Senior Secondary Government Schools were represented. The main private and mission schools which follow the Ministry of Education's curriculum sent representatives also. Ninety teachers attended the course, including Ethiopians, expatriates and Indians. All participants were issued certificates of attendance.

C. Program

Participants attended a six-hour session every day for the three weeks. Each day consisted of two lectures, one supervised study period and tutorials in the morning, followed by more supervised study and tutorials in the afternoon.

1. Lectures

The visiting EDC lecturers at the seminar were Dr. Paul Johnson of the University of California and Dr. B. J. Pettis of the University of North Carolina. Dr. Johnson lectured on sets, the meaning of a counting number, different numeration systems and real numbers. Dr. Pettis spoke on the properties of rational numbers, open sentences in one and two variables, and geometry.

2. Tutorials

Directed study sessions were an essential part of the program. They went a long way toward helping the participants discover and correct their misunderstandings. The group was divided into ten subgroups for supervised study and tutorials. Assisting the professors at

the seminars were the following tutors:

| | |
|-----------------------|---|
| Ato Yohannes Menkir | Haile Selassie I University and University of Michigan |
| Ato Bisrat Dilnesahu | Haile Selassie I University and University of California |
| Ato Zewdie Wolde | Bede Mariam Laboratory School, Haile Selassie I University |
| Ato Abebe Tafesse | Bede Mariam Laboratory School, Haile Selassie I University |
| Ato Abebe Gabre Kidan | Haile Selassie I University and University of Utah (Ministry of Education) |
| Mr. Tom Orum | Yale University |
| Mr. Philip Thorn | Yale University |
| Mr. Denis Leitner | San Diego State University (Peace Corps Volunteer) |
| Mr. David Hartman | Cornell University (Peace Corps Volunteer) |
| Mr. Clifford Gay | Pomona College, Claremont, California (Peace Corps Volunteer) |

D. Conclusion

Physical accommodations at the university were adequate. However, an Institute of this size might benefit from better organization and planning.

The majority of the participants showed marked improvement in their understanding of the secondary materials and greater confidence in coping with the more difficult problems at the end of the Institute. On the basis of experience gained through their assistance at the ABC Institute and at this Institute, Messrs. Orum and Thorn plan to remain in Ethiopia for several months and travel in provinces around the Addis Ababa area as part of the Modern Mathematics Teacher Training Assistance Project. Their task will consist of introducing modern mathematics to ninth grade teachers and organizing courses for secondary and primary mathematics teachers.

Summary: Report by Miss Lucy L. Addy and Professor Shirley Hill
on the Teacher Training Institute at University of Ghana in Legon, Ghana
August 27 - September 8, 1967

A. Participants

The participants were selected from twenty primary schools. They included 18 headteachers, 30 teachers from primary schools within the Accra district, and 5 Peace Corps Volunteers.

B. Visitors

Visitors to the Institute included Mr. I. N. K. Atiase, Deputy Chief Education Officer (Research); Mr. J. S. Ocran, Principal Education Officer; Mr. K. Thompson, District Education Officer, Accra; Mr. A. D. Mortagbe, Senior Education Officer, Inspectorate Division; several other education officers, one headmaster, and five primary teachers.

C. Program

The opening address at the Institute was given by Mr. I. N. K. Atiase, Deputy Chief Education Officer (Research), who emphasized that children should be encouraged to take active part in lessons.

1. Morning Activities. Each morning there were lectures given by Professor Shirley A. Hill and Dr. D. K. Abbiw-Jackson. Topics covered included: sets, numeration, operations, language of mathematics, modular arithmetic, sets of points, measurement, geometric constructions, movements and symmetry, number plane, and collecting, organizing and interpreting data.
2. Afternoon Activities. Afternoons were devoted to lectures and demonstration lessons from 2:30 to 3:30 p.m. and tutorials and discussions from 3:30 to 4:30 p.m. Five of the headteachers were appointed leaders of the five tutorial groups. The Peace Corps Volunteers were assigned to the groups to act as tutors. Participants discussed the lectures and activities in the books and worked some of the problems. Reports from the tutors indicated that in general the teachers were attentive, enthusiastic and open to new ideas.

Two demonstration lessons were organized during the two-week course. Thirty-six pupils from the South Labadi Road Estate Primary Class Four were used. The first lesson was on "Operations on whole numbers using operation machines"; the second was on "Folding and Turning Symmetries of Geometric Figures." The children showed a lively interest in the lessons and proved to the teachers that the new mathematics could be taught successfully.

D. General Comments

The seminar was extremely well organized and administered. The tutorials and demonstration lessons were excellent. It was felt that the policy of including headteachers in all seminars was a good one. Their previous work on Entebbe materials and their observations and experiences in classroom use of the books helped give confidence to the other teachers who were newcomers.

NUMBER OF CLASSES USING ENTEBBE PRIMARY TEXTS AS OF OCTOBER 15, 1967

| <u>Country</u> | <u>Primary One</u> | <u>Primary Two</u> | <u>Primary Three</u> | <u>Primary Four</u> | <u>Primary Five</u> |
|----------------|--------------------|--------------------|----------------------|---------------------|---------------------|
| Ethiopia | | | | | |
| Ghana | 28 | 26 | 24 | 24 | 14 |
| Kenya | 77 | 69 | 65 | | |
| Liberia | 15 | 13 | 10 | 5 | |
| Malawi | 14 | 11 | 6 | 5 | |
| Nigeria* | | 72 | 28 | 11 | 6 |
| Sierra Leone | 7 | 7 | 6 | 5 | 2 |
| Tanzania | 41 | 28 | 29 | 17 | |
| Uganda* | | 20 | 3 | 2 | |
| Zambia* | | <u>26</u> | <u>16</u> | <u>2</u> | <u>1</u> |
| <u>Total</u> | 182 | 272 | 187 | 71 | 23 |

Total number of primary classes: 735

* These figures based on October 1, 1966 report. (Figures for present report not available.)

Note: Latest report dated March 1, 1967 states that in Nigeria there are 130 primary classes and 200 secondary classes using Entebbe texts;
in Uganda there are 28 primary classes using Entebbe texts.

EDUCATION DEVELOPMENT CENTER

NUMBER OF CLASSES USING ENTEbbe SECONDARY TEXTS AS OF OCTOBER 15, 1967

| <u>Country</u> | <u>5 Year Course</u> | | | | | <u>4 Year Course</u> | | | |
|----------------|----------------------|---------------|---------------|---------------|---------------|----------------------|-----------------|-----------------|-----------------|
| | <u>Sec. 1</u> | <u>Sec. 2</u> | <u>Sec. 3</u> | <u>Sec. 4</u> | <u>Sec. 5</u> | <u>Sec. C-1</u> | <u>Sec. C-2</u> | <u>Sec. C-3</u> | <u>Sec. C-4</u> |
| Ethiopia | | | | | | 350 | 10 | | |
| Ghana | | | 1 | 1 | | 24 | 11 | | |
| Kenya | | | | | | 15 # | | | |
| Liberia | 15 | 7 | | | | 3 | 3 | 1 | |
| Malawi | | | | | | | | | |
| Nigeria* | | 79 | 27 | 27 | 6 | | 12 | | |
| Sierra Leone | 8 | 1 | 1 | | 1 | 3 | | | |
| Tanzania | | | | | | 34 | 26 | | |
| Uganda* | | 4 | 4 | 4 | | | 4 | | |
| Zambia* | — | <u>1</u> | <u>1</u> | — | — | <u>12 #</u> | <u>1</u> | — | |
| <u>Total</u> | 23 | 92 | 34 | 32 | 7 | 441 | 67 | 1 | |

Total number of secondary classes: 697

* These figures based on October 1, 1966 report. (Figures for present report not available.)

Starting January 1, 1968

African Mathematics Program

TRAVEL REPORT

Purpose of Travel: To visit African Ministries of Education, local USAID Officers and local Peace Corps Directors; to discuss the affairs of the African Mathematics Program and to observe Entebbe texts being used in the classroom.

Names of Visitors: Professor W. T. Martin, Chairman, Mathematics Department, M.I.T., and Chairman, Steering Committee, African Mathematics Program.

Mr. Hugh P. Bradley, Education Development Center,
Program Director, African Mathematics Program.

Mr. John Joanou, Education Development Center, Assistant
Program Director, African Mathematics Program.

Period of Visits: June 3, 1967 to August 17, 1967

Topics Discussed:

- a) The continuing use of the Entebbe Mathematics Series.
- b) The availability of the Entebbe texts.
- c) Problems of complete adoption of modern mathematics throughout the school systems.
- d) Plans for using the participants of the ABC Institute.
- e) The CREDO/EDC Conference on African Education, planned for September 1967.
- f) Specific matters, as raised by the Ministries, concerning the African Primary Science Program.

Countries Visited: England, Liberia, Sierra Leone, Ghana, Ethiopia, Kenya, Uganda, Tanzania, Zambia, and Malawi. As requested by the U.S.A. Embassy in Nigeria, all visits in Nigeria were cancelled.

ENGLAND

Dates: June 4 through June 6, 1967

Visitor: Mr. H. P. Bradley

Visited: Mr. Peter Jones, Examiner to Cambridge Examinations Syndicate
Mr. David Neale, Managing Director, SRA (England)
Mr. David Morris, Director, CREDO

Outcome:

- a) Mr. Jones was unable to attend the 1967 Mathematics Workshop, but subsequent to the visit he was asked to moderate the West African Examinations Council's examination paper for the Entebbe O-level examination.
- b) SRA England are proceeding with the commercial publication of the Entebbe Basic Concepts Volume I and Volume II. The commercial publication of Secondary C1 and Secondary C2 was also discussed.
- c) Replies and invitations to the September Conference on African Education and general plans for the Conference were discussed.

LIBERIA

Dates: June 7 through June 11, 1967

Visitors: Mr. H. P. Bradley, Mr. John Joanou

Visited: The Hon. Mr. Augustus Caine, Secretary, Department of Education
Mr. Richards, Assistant Secretary, Department of Education
Mr. A. Nebo, Director of Secondary Education
Mr. Somerville, Under-Secretary for Education
Mrs. Doris Banks-Henries, Director of Text Books and Curriculum Development
Mr. John Norris, Peace Corps Volunteer i/c Entebbe Mathematics Program in Liberia
Mr. Don Perardi, PCV designate i/c Entebbe Mathematics Program in Liberia on the departure of Mr. Norris
Mr. Dick Hailer, Peace Corps Supervisor
Mr. Jordan Holtan, Peace Corps agricultural adviser
Fr. Conner Lynn, Superior, Bolahun Holy Cross Mission
Fr. Sullivan, Bolahun Mission, French teacher
Bro. George, Bolahun Mission, music teacher
Bro. Lawrence, Headmaster, St. Cyprians High School, Bolahun
Mrs. Karen Chew, Headmistress, St. Agnes School, Bolahun
Mr. Moses Jange, Grade 4 teacher, St. Agnes (high school graduate)
Mr. Stephen Kpoto, Grade 2 teacher, St. Agnes (high school graduate)
Miss Anna Randolph, Grade 1 teacher, St. Agnes (9th grade completed)
Mr. Thomas Fodey, Grade 3 teacher, St. Agnes (41 years teacher)
Mr. Paul Aliew, Grade 3 teacher, St. Agnes (Sierra Leone)
Mr. Stephen Vafee, Grade 2 teacher, St. Agnes (high school graduate)
Mr. Richard Johnstone, Teacher St. Cyprians H.S. (American graduate)

Mr. Kent Fisher, teacher St. Cyprians H.S. (American graduate)
Mr. Sigel Floyd, PCV teacher, St. Cyprians H.S. (American graduate)
Mr. M. J. Bettie, Laboratory High School, University of Liberia,
Monrovia
Dr. John Gay, Cuttington College
Dr. Igor Kopytoff, Dept. of Anthropology, University of Pennsylvania
Mr. Edward Shawacker, Mathematics Department, Cuttington College
Mr. T. Rutherford, Biology Department, Cuttington College
Mr. Ron Carol, Biology Department, Cuttington College
Dr. Baker, Principal, Cuttington College
Mr. Sills, Director, Peace Corps/Liberia
Mr. Lynn P. Hartzler, USAID Office, Monrovia
Dr. Holmgren, Rural Education Officer, USAID Office, Monrovia
Miss Rita Raye, USAID Advisor to Department of Education,
Curriculum Development Materials Center

Outcome of Discussion: The present state of the program in Liberia and indications of future plans are outlined in the Liberian Report at the Opening Plenary Session of the 1967 Mathematics Workshop.*

In general, the Secretary and the Department officials were enthusiastic about the program and had in mind the need to make a proper evaluation of the work and the urgent need for teacher education. It was intended to continue with an intensive program of summer schools and the program was asked to continue with its assistance in this aspect of the work.

- b) The phasing out of the experimental use of the texts was discussed. Interest was expressed about the SRA (England) commercial versions. The comment was made that when the present expensive modern mathematics texts need replacing, Entebbe texts could be purchased.
- c) Comment was made on the tremendous teacher training task required to bring about complete adoption of modern mathematics. The plan to use seven Peace Corps Volunteer teachers had been developed to deal with this problem. It was also hoped that the local USAID mission might give some financial help in replacing old texts with new ones.
- d) The participants in the ABC Institute were already involved in teacher training activities. It was planned to use them considerably in weekend workshops and in the teacher training colleges, working co-operatively with the PCV "circuit riders". (A weekend Peace Corps Science Workshop was attended. The volunteers showed great interest in the work of the African Mathematics Program and in the materials of the African Science Project.)
- e) The Hon. Secretary Caine expressed interest in the CREDO/EDC meeting and affirmed his intention to attend.

* Sent to USAID/W September 6, 1967

- f) The Department is presently outfitting quarters for a Science Curriculum Development Centre and is planning to recruit a local counterpart and trusts that EDC will supply a Science Educator in due course. Mr. Holmgren, USAID, expressed great interest and support for the Peace Corps circuit riders idea.

Schools Visited: St. Agnes Primary School, Bolahun.

Lessons Observed:

Grade 4: Mr. Moses Jange. Making Mathematical sentences involving four line addition.

Grade 2: Mr. Kpoto. Equations and inequalities (Primary II. Volume 2, page 81)

Grade 3: Mr. Fodey. "What makes these sentences true?" (Primary III, Volume 1, Unit 3)

Grade 1: Anna Randolph. Numbering sets and counting 1 to 9.

Grade 3: Paul Aliew. "What makes these sentences true?" $(6 \times 3) + N = 20$. (Primary III, Vol. 1, Unit 6)

Grade 4: Stephen Vafee. Use of associative property $a = 30 \times 40 = (3 \times 10) + (4 \times 10)$ etc. (Pupils 4, page 82)

Grades 10 and 11: Mr. Kent Fisher. Simple operations with algebraic expressions identifying properties being used. (Secondary 4 Algebra, Page 47).

SIERRA LEONE

Dates: June 12 through June 16, 1967

Visitors: Professor Martin, Mr. H. P. Bradley, Mr. John Joanou

Visited: Mr. John P. Milligan, Education Officer, USAID
Dr. Lettie Stuart, Department of Education
Mr. Edmund Cole, Department of Education
Mr. Thomas, Department of Education
Mr. Wesley, Supervisor, Rural Education, Ministry of Education
Dr. Awadagin Williams, University College, Fourah Bay College
Dr. W. C. E. Young, Department of Education, Fourah Bay College
Mr. Dyck Harding, Milton Margai Teacher Training College
Dr. John Simbo, University College, Fourah Bay
Dr. Davidson Nicol
Mr. Julius Jonah, Prince of Wales Secondary School
Dr. Faruqi, Director, UNICEF
Mr. Joe Kennedy, Director, Peace Corps

Mr. W. Tutman, Deputy Director, Peace Corps
Mr. Gary Knamiller, Associate Director, Peace Corps
Mr. Howard, Social Studies Director, Peace Corps
Mr. John North, UNESCO lecturer at Milton Margai TTC
Miss F. Hedd, Annie Walsh Memorial School
Mrs. M. Greene, Annie Walsh Memorial School
Mrs. H. Williams, Headmistress, Tower Hill School
Miss Taylor, Class 4, Tower Hill School
Miss Thomas, Class 2, Tower Hill School
Mrs. Benjamin, Class 3, Tower Hill School
Miss Mason, Class 4, Tower Hill School
Mrs. Abadjee, Headmistress, Buxton School
Miss Roberts, Class 1, Buxton School
Miss Williams, Class 2, Buxton School
Mrs. Betts, Kindergarten, College School
Mrs. Harding, Class 1, College School
Mrs. Hyde Foster, Principal, Annie Walsh Memorial School
Miss Dewdney, Class 2, Buxton School
Prof. Roger Brown, University of Njala
Mr. Norman Cole, University of Njala

- Outcome of Discussions: a) The present state of the program in Sierra Leone and indications of future plans are outlined in the Sierra Leonean Report at the Opening Plenary Session of the 1967 Mathematics Workshop at Mombasa. The meeting in the Ministry was attended by all the Ministry officials listed with Dr. Awadagin Williams and Mr. Dyck Harding attending as representatives of the Mathematical Advisory Committee appointed by the Ministry. The committee has made firm recommendations for the spread of modern mathematics to all classes in Sierra Leone but the official approval for this proposal has not yet been given. Suggestions were made regarding the use of Peace Corps Volunteers to help to supervise and organise the spread of the Entebbe material. The Ministry felt that this could be very useful and agreed to investigate the possibility. At a later meeting Mr. Kennedy, the P.C. Director, promised full co-operation.
- b) The phasing out of the experimentation work was discussed and the prices of the new commercial texts came under consideration. A financial difficulty seemed likely as the new texts were introduced to the schools. It was decided that help should be sought from USAID and other sources. At a later meeting, Dr. Faruqi of UNICEF was sympathetic to the idea that his organisation should consider giving some help in this direction.
- c) Suggestions were made to deal with the problems of complete adoption of modern mathematics throughout the schools. These problems were mainly in terms of cost, lack of supervision and teacher education. The appointment of a mathematical educator to Fourah Bay to co-ordinate supervision and teacher education would be of tremendous help. Such a person working closely with Peace Corps 'circuit riders' could do much to solve the problems worrying the Ministry. The Ministry Officers

and the Advisory Committee decided to seek such help.

- d) Most of the ABC participants teach in the Freetown area and will be unable to assist much in courses up-country. However, it is intended to use these participants in Freetown courses.
- e) At a later meeting, Mr. W. Condon stated he would attend the Oxford meeting.
- f) Dr. Roger Brown and Mr. Norman Cole, of the University of Njala, described the Curriculum Development work in Science being carried out at the University. One pamphlet on buds and twigs has already been published and other pamphlets are in preparation. There appears to be considerable enthusiasm. Mr. Milligan, USAID, showed much willingness to cooperate with plans for the development of mathematical education which the Ministry would present.

Schools Visited: Tower Hill School

Class 1. Miss Taylor, Introduction to multiplication through sets. Children used counters.

Class 2. Miss Thomas. Parts of sets (Fractions)

Class 3. Mrs. Benjamin. "Make this sentence true" $c = 4 \times 6$

Class 4. Miss Mason. Story problems. Making sentences.

Buxton Primary

Class 1. Miss Roberts. Making up numbers.

Class 2. Miss Williams. Inequalities. Greater than and less than.

College School - Fourah Bay College

Kindergarten. Miss Betts. Free activity forming sets.

Mrs. Harding. Recognition of sets.

Mrs. Dewdney. Addition and Subtraction.

Prince of Wales Secondary School

Form 4. Mr. J. Jonah. Solution of equations.

Annie Walsh Memorial School

Mrs. Hyde - Foster, Principal

Form 2. Mrs. M. Greene. Symmetry.

Holy Trinity Infants School

Mrs. N. L. Kissling, Principal

Class 1. Miss Cole. Sets, Halves (Primary 1, Vol. 1)

Class 2. Mrs. Cole-Jones. Find the missing numeral.

Class 3. Miss Leopold-George. Geometry. Extending the line segment.

Class 4. Miss C. M. Bell. Story Problems.

Masorie School - Yila (Rural Primary School)

Mr. Samuel Kaindaneh, Principal

Class 2. Mrs. B. S. Lansana. English.

Class 3. Mr. S. K. Blake. Science.

NOTE: Since our return to the United States we are informed that, acting on the request of Dr. Lettie Stuart of the Department of Education, a Peace Corps Volunteer has been appointed as mathematics coordinator for Entebbe and to assist other existing math programs and teacher training in Freetown and the Western Provinces.

GHANA

Dates: June 16 through June 27, 1967

Visitors: Professor W. T. Martin, Mr. H. P. Bradley, Mr. J. Joanou. Professor Martin and Mr. Joanou left Accra for Ethiopia on June 20, 1967.

Visited: Mr. D. A. Brown, Permanent Secretary, Ministry of Education
Mr. J. L. Annang, Deputy Chief Education Officer, Ministry of Education
Mr. Attiase, Deputy Chief Education Officer, Ministry of Education
Mr. Ocran, Principal Education Officer (Primary)
Mr. Kitcher, Principal Education Officer (Teacher training)
Mr. A. D. Mortagbe, Secondary Inspector
Miss Lucy Addy, Ministry of Education (Entebbe supervisor)
Dr. D. K. Abbiw-Jackson, College of Science and Technology, Kumasi
Mr. Theo Armar, Headmaster, West Africa Secondary School
Mr. G. Gerhardt, P/C Teacher, West Africa Secondary School
Mr. J. Okine, Ass't Headmaster, Accra Academy
Mr. George Awoonor Williams, Managing Director, Ghana Film Industries Corp.
Mr. R. O. Fenoku, Production Director, Ghana Film Industries Corporation
Mr. Danso, Administrative Secretary, Ghana Film Industries Corporation
Mr. G. Betts, Education Officer, USAID/Ghana
Mr. Boston, Deputy Director, USAID/Ghana
Mr. Frank Pinder, Director USAID/Ghana
The Hon. Franklin Williams, U.S. Ambassador, American Embassy

Dr. Kline, Director, Peace Corps/Ghana
Dr. J. Kirk, Deputy Director, Peace Corps/Ghana
Mr. Cronje, Registrar, West African Examination Council, Accra
Mr. E. K. Somua Wiafe, West African Examination Council, Accra
Dr. A. A. Boahen, Head, History Department, University of Ghana, Legon
Dr. K. T. Dickson, Geography Dept., University of Ghana, Legon
Dr. E. Blyden III, Director, Institute of African Studies,
University College of Sierra Leone, Fourah Bay
Mr. Hyde, Secretary, Institute of African Studies, University
College of Sierra Leone, Fourah Bay
Dr. A. Porter, Principal, University College, Nairobi
Mr. W. Conton, Chief Education Officer, Ministry of Ed. Sierra Leone
Mr. G. Adhong, Headteacher, South Labadi Road Estate Grammar School

Mrs. Ohone, Class 1
Mrs. Asiedu, Class 2
Miss Nutakom, Class 3
Mrs. Nortey, Class 4

Outcome of Discussion: a) The present state of the program in Ghana and indications of future plans are outlined in the Ghana Report at the Opening Session of the 1967 Workshop (Appendix).

It was clear from the discussions that the Ghanaian Ministry has decided to adopt modern mathematics throughout its school system. The Entebbe texts will be used in Primary Schools and in Teacher Training Colleges. At secondary level, continuing experience will be gained by having increased use of the Entebbe Secondary texts as well as those of the Joint School Project. One feature discussed was the need for at least two courses to prepare teachers to use Primary Four, Five and Six.

- b) Problems arising from the phasing out of the experimental program were discussed and the Ministry was informed of the availability of commercial texts.
- c) Teacher education, supervision, and replacement of textbooks were the main items which were considered in the Ghanaian plan for complete adoption. USAID will be contacted for help in the appointment of a mathematician to run secondary courses and to supervise primary courses and the local adoption of the Entebbe material. The Peace Corps will be asked to provide six or seven Volunteers to travel up-country supervising teacher training colleges and demonstration schools. An additional Peace Corps Volunteer may be requested to assist Miss Lucy Addy in the Ministry and the supervision of Accra and coastal schools.
- d) The ABC participants will be used in all in-service courses and for supervision of schools close to their colleges.
- e) Mr. Mills, Chief Education Officer, and Mr. Attiase, Deputy Chief Education Officer, will be attending the Oxford Meeting on African Education.

- f) The Science Curriculum Development Centre is not yet fully set up, but the EDC Science Educator and his Ghanaian counterpart, Mr. Bortei-Doku, have already started some units in a few schools. Both were very busy, helping to set up the Science Workshop at Akosombo
- g) In discussions with the West African Examination Council plans for the setting of an Additional Mathematics O level examination were reviewed.

Schools Visited: South Labadi Road Estate School

Mr. G. Ashong, Headteacher

Class 1. Mrs. Ohone, Discussed sets.

Class 2. Mrs. Asiedu. Addition, number line.

Class 3. Miss Nutakon. Use of tiling of rectangles to teach multiplication of integers. Primary 3, Unit 8, p. 109.

Class 4. Mrs. Nortey. Discussed addition. Primary 4 distributive, commutative, associative properties.

Social Studies: An ad hoc group consisting of Dr. Porter, Dr. Blyden, III, Dr. Boahen, Mr. Hyde, Dr. Dickson, Mr. Conton, Mr. J. L. Aldrich (EDC), Dr. L. Fuchs (Brandeis), Dr. W. Johnston (M.I.T.), and Mr. H. P. Bradley (EDC), met to discuss African School Social Studies. The three main points arising from this discussion were:

i) An African Primary Social Studies Curriculum Reform Program was needed;

ii) The first step (two years or more) of such a program should be the gathering of suitable material, either by new research or by extraction from existing records;

iii) Each country should appoint a group, consisting of selected "types" of people, to attend a workshop to create its own Social Studies Program drawing on the collected materials as required and making use of other services provided, such as artists, cartographers, educators, substance consultants, publishing and printing experts.

ETHIOPIA

Dates: June 21 through June 27, 1967

Visitors: Professor W. T. Martin, Mr. J. Joanou

Visited: Ato Tadesse Terrefe, Assistant Minister of Programme, Planning and Research, Ministry of Education
Mr. John C. Fitzgerald, Curriculum Department, Mathematics, Ministry of Education
Ato Yohannes Menkir, Department of Physics, Haile Selassie I University
Dr. Mulugeta Wodajo, Dean, School of Education, Haile Selassie I University

Dr. V. C. Pleijel, UNESCO Visiting Professor, Haile Selassie I
University (Stockholm)
Mr. Denis Blezard, Director, Ethiopian Television Office
Miss Janet Hyde-Clark, Program Director, Ethiopian Television Office
Dr. W. Niblo, Chief Education Officer, USAID
Dr. Mossler, Director, USAID Ethiopia
Miss V. Pow, Secondary School Teacher
Ato Chaka Woorgesa, Mathematics Teacher
Dr. David E. Berlew, Peace Corps Director, Ethiopia

Outcome of Discussions: Discussion at the Ministry meeting centered on ways in which the plan for complete adoption of Secondary C One Entebbe in all the ninth grade classes in Ethiopia could be effected. The plan, drawn up in September 1966 by the Curriculum Department of the Ministry of Education, requested EDC assistance for an Institute to introduce the Secondary materials to some 90 teachers who would begin teaching in the fall of 1967. (A report of this Institute held August 15 - September 1 will be found in Appendix D of this report.) The plan calls for the continuing use each year of Secondary C One material in all ninth grade classes with one additional course to be added each year until the complete Secondary C program is in use throughout Ethiopia. In addition to adopting secondary materials, the Ministry has begun translating Primary I into Amharic for adoption by all Primary schools throughout Ethiopia in the fall of 1969.

- b) The Ministry has undertaken the task of printing 15,000 copies of Secondary C One Algebra and Geometry for use this fall. EDC has provided texts for the August Institute and copies of Basic Concepts of Mathematics for teacher training classes.
- c,d) The Ministry is well aware that complete adoption of Primary as well as Secondary Entebbe requires a major teacher training effort. To cope with this situation, they are planning additional Institutes with the assistance of EDC and the ABC participants. Miss Pow, a 1967 ABC Institute participant, is preparing an adaptation of Basic Concepts of Mathematics for use in training teachers for grades I - VI; Ato Chaka Woorgesa will translate Primary I into Amharic.

The teacher training effort will be further assisted in the Addis Ababa area by a weekly 30 minute television program on Secondary Entebbe which is being prepared by Miss Janet Hyde-Clark of National Ethiopian Television with the assistance of Miss Larkin, a Peace Corps Volunteer. In a discussion at the USAID offices in Addis Ababa, Dr. W. Niblo, Chief Education Officer, endorsed the proposed plan for Peace Corps "circuit riders" to assist in mathematics and science courses and in physical education programs.

- e) Ato Tadesse Terrefe of the Ministry of Education is planning to attend the CREDO/EDC Conference on African Education in England, September 1967.
- f) Ato Tadesse Terrefe voiced interest in getting whatever assistance he can from the Peace Corps. At this time 28 PCVs are being trained at EDC under the direction of COR Dr. John Bigelow.

KENYA

Dates: June 28 through July 2, 1967 and July 12 through July 14

Visitors: Professor W. T. Martin, Mr. H. P. Bradley, Mr. John Joanou

Visited: Mr. Gilbert Oluoch, Director, Curriculum Development Centre, Nairobi
Mr. George Edmonds, T.E.E.A., Mathematics Educator, Curriculum Development Centre, Nairobi
Mr. Morris, British Council appointee, Mathematics Education, Curriculum Development Centre, Nairobi
Mr. W. Warren, EDC Science Educator appointee, Curriculum Development Centre, Nairobi
Mr. Dilbagh Singh, Education Officer, Curriculum Development Centre, Nairobi
Mr. Kimpti, Mathematics Education Officer, Curriculum Development Centre, Nairobi
Mr. Frank Richardson, Curriculum Development Center, Nairobi
Mr. Hollingshead, TEEA Mathematics appointee to University College, Nairobi
Mr. C. C. Desai, Inspector, Ministry of Education
Mr. Nyagah, Permanent Secretary, Ministry of Education
Mr. Mwendwa, Chief Education Officer, Ministry of Education
Mr. J. Gitau, Assistant Chief Education Officer, Ministry of Education
Mr. Kimoni, Deputy Chief Education Officer, Ministry of Education
Dr. Dietrich, USAID Education Officer
Mr. Bernal, USAID Ass't Education Officer
Dr. Boucher, Regional Program Planning Officer, USAID
Mr. Dick Richter, Peace Corps, Deputy Director
Mr. Robert Siegel, Peace Corps, Assistant Director
Dr. Robin, Ford Foundation Representative
Mr. Courtney Nelson, Ford Foundation, Assistant Representative
Mr. Herbert Kanina, Inspectorate
Dr. Arthur Krival, Director, Wisconsin Radio and Correspondence Teacher Training Program in Kenya
Dr. Karl Vanderlin, Mathematics Department, Wisconsin University, Consultant to the W.R.C.T.T.P.
Mr. Sabwa, Provincial Education Officer, Coast Province
Mr. Awala, Municipal Education Officer, Mombasa
Mr. Callandar, Nairobi Education Officer

Miss Savita Khanna, City Education Department, Nairobi
Mr. F. Bentley, Principal, Shanzu Teacher Training College
Mr. Isiah Ruffin, Music Organiser, Kenya, attached to the
Shanzu Teacher Training College

- Outcome of Discussions:
- a) The Kenya Ministry has decided to have longer trial use of the Entebbe Primary texts before undertaking adaptation of Primary Four, Five and Six.
 - b) The Kenya Ministry has decided to use the Entebbe Secondary C One texts in 15 classes beginning January 1968.
 - c) The Kenya Ministry has requested assistance in running courses in December from Teacher Training Tutors and in July for Secondary School Teachers.
 - d) The Ministry expressed the need for assistance in supervision of the work of the Entebbe program.
 - e) The Program agreed to make available texts for Secondary C One and to continue to supply texts for Primary Five and Six. Basic Concepts texts will also be supplied in limited numbers.
 - f) The Ministry accepted the idea of a regional appointee to deal with some of the problems of complete adoption. In particular, the appointment of mathematicians on a regional basis to help run courses and supervise adaptation was acceptable. Such people would be in addition to Mathematical Educators like Dr. A. Beninati, Mr. G. Edmonds and Dr. Anderson.
 - g) The ABC participants will be used in the Curriculum Development Centre, in training colleges and will help to staff institutes.
 - h) Mr. Mwendwa and Mr. Oluoch will attend the Oxford meeting on African Education.
 - i) There was limited discussion in the Ministry and at USAID with Dr. Dietrich and Dr. Boucher about the appointment of additional EDC educators to the Curriculum Development Centre. The Ministry is very enthusiastic about the project and the local USAID officials seemed to approve the proposals - though with some reservations.

NOTE: Mr. Robert Siegel, Associate Director, Peace Corps, Nairobi, wrote us on October 10, 1967 that a Peace Corps Volunteer is extending his tour one year to work with Entebbe Mathematics at the Curriculum Development and Research Centre in Nairobi.

UGANDA

Dates: July 9 through July 11, 1967

Visitors: Professor W. T. Martin, Mr. H. P. Bradley

Visited: Mr. W. Senteza Kajubi, Director, National Institute of Education
Mr. Kiwanuka, Chief Inspector of Schools
Mr. J. Aryada, Assistant Chief Inspector of Schools
Mr. W. Rwetsiba, Permanent Secretary, Ministry of Education
Mr. A. M. Baguaywa, Senior Inspector, Primary Schools
Mr. F. H. Gravey Williams, Senior Inspector, Secondary Schools
Dr. Adams, Education Officer, USAID
Mr. Careccio, Mathematics Tutor, Kibuli Teacher Training College
Miss Nabooza, Teacher, Kibuli Demonstration School
Mr. Louis Fillinger, Lady Irene College, Bombo
Miss Gibbs, Principal, Lady Irene College, Bombo
Mr. Scott Craigie, SPAN Study Program
Mr. Samuel Kagiri, Lady Irene College
Mr. Rowland Anderson, T.E.E.A. appointee to the Lakerere
Institute of Education

Outcome of Discussions: a) The report on the state of the Program in Uganda is outlined in the notes of the Opening Plenary Session of the 1967 Workshop.

Ministry officials expressed concern about the poor quality of the local adaptation of the Entebbe texts which they had been forced to accept. Plans for preparation of a mathematics syllabus for introduction into the four consolidated teacher training institutes were discussed. EDC was asked to assist in a Tutors Institute planned for Easter 1968.

- b) It was agreed that some additional copies of Basic Concepts One should be given to the Uganda Training Colleges.
- c) There was some discussion on tentative plans for a coordinated regional plan to deal with the problems arising from the full scale adoption of modern mathematics. Mr. W. Senteza Kajubi of the Institute of Education and Dr. Adams of USAID seemed to show interest in the possibility of a mathematician being appointed to work in East Africa to assist in teacher education at Secondary level and to supervise adaptations of the Entebbe texts.
- d) Regret was expressed that Uganda had been unable to send its full quota to the ABC Institute. It was fully intended to use the participants in running courses and helping in the spread of modern mathematics in Uganda.
- e) Mr. Kiwomuka and Mr. Kajubi stated they would be attending the Oxford meeting on African Education.
- f) Mr. Kajubi and the Ministry appeared to be very keen to start a Science Curriculum Development Centre. It was hoped that housing problems would be overcome and that the EDC Science Educators could be approached.

Visits to Colleges: Visits were made to the Kibuli Teacher Training College and its Demonstration School and to the Lady Irene College at Bombo. Mr. Careccio at Kibuli was using the Entebbe texts along with some SMSG texts which he had bought with his own funds. He agreed that the layout and style of the latter was frequently difficult for his students.

Miss Gibbs of the Lady Irene College stated that she was about to experiment with the Dienes materials.

TANZANIA

Dates: July 17 through July 19, 1967

Visitors: Professor W. T. Martin, Mr. H. P. Bradley, Mr. D. Pinck

Visited: Mr. J. Sawe, Principal Secretary, Ministry of Education
Mr. Mwonafupa, Education Officer (Primary)
Mr. Michael J. Kinunda, Inspectorate
Mr. J. E. Phythian, Mathematics Department, University College, Dar Es Salaam
Professor Honeybone, Vice-Principal, University College, Dar Es Salaam
Mr. Chinyama, H/M Kawe Primary School
Mr. Banda, Primary Inspector
Mr. Komba, Teacher, Kawe Primary School
Mr. Fitma, Teacher, Kawe Primary School
Sr. Saloma, H/M St. Joseph's Primary School, Dar Es Salaam
Mr. Cardoza, Std. III Teacher, St. Joseph's Primary School
Miss Devine, Std. IV, St. Joseph's Primary School
Miss D'Cruz, Std. II, St. Joseph's Primary School
Sr. Jacontes, H/M St. Joseph Secondary School
Miss King, Teacher, Form II
Mr. John Teshe, Primary School Inspector
Mr. Kiwanga, H/M Mnazi Moja Primary School
Mr. Mnyame, Std. IV Teacher, Mnazi Moja Primary School
Mrs. Mwalwise, Std. III Teacher, Mnazi Moja Primary School
Mr. Norman Laiser, Research Ass't, University College, Dar Es Salaam
Miss Kindy, Form II Teacher, St. Joseph Secondary School, Dar Es Salaam
Mrs. D'Souza, Acting H/M, Jangwani Girls Secondary School
Mrs. Kisanga, Form I Teacher Jangwani Girls Secondary School
Dr. E. Godfredson, EDC Science Educator

Outcome of Discussions: a) The report on the state of the program in Tanzania is outlined in the notes of the Opening Plenary Session of the 1967 Workshop.

Ministry officials and University faculty are very enthusiastic about the development of modern mathematics in Tanzania. In November 1967 all Primary One classes in Tanzania will start

using the Swahili translation of the Entebbe Primary One text. The Secondary School experiments are well advanced and the Ministry has already decided to favour the Entebbe texts rather than the E.A. SMP texts. Apparently teachers found the SMP texts difficult to teach. It was stated that an adapted secondary text for Tanzania will be prepared and that the Entebbe text will serve as the core for this new book. Extended use of Basic Concepts in Training Colleges was discussed and a very strong request was made for the new Teachers' Handbook.

- b) Tanzania is printing its own Swahili version of the Primary texts.
- c) University and Ministry officials expressed much interest in the possibility of operating regionally to solve some of the problems arising from the complete adoption of modern mathematics in East Africa. Dr. Honeybone stated he would raise the matter with Mr. Senteza Kajubi and there were indications that there might be informal discussions between Mr. Rea, USAID, and Dr. Honeybone, and possibly Mr. Sawe.
- d) The ABC participants are being used fully. They and other secondary teachers are being instructed to help in running courses for primary teachers.
- e) Mr. Sawe stated that he could attend the Oxford meeting on African Education.
- f) The Officials in the Ministry seemed to be very pleased with the efforts of the Science Curriculum Development Centre operating under the direction of Dr. Godfredsen. Some units with a strong agricultural bias are being produced and good contacts with training colleges are being developed.

Schools Visited: A science lesson(seeds)was observed at the Kawe Primary School.

At St. Joseph's Primary School in Dar Es Salaam some very fine children's work was observed. In Std. III (teacher, Mr. Cardoza) children were finding solutions for mathematical sentences, e.g., $8 \times n = 40$, and using arrays and repeated addition to demonstrate multiplication facts. Class IV b and II b and Form II e were also observed. A talk was given to the girls in Form II e. At Mnazi Moja Primary School, Mr. Mnyami (Std. IV) and Mr. Mwalwise (Std. III) were observed working with their classes.

At Jangamwani Girls' Secondary School the work of Form I K was observed and a talk given to the girls.

N.B. - It was stated that members of the Chinese Embassy visited Entebbe classes in Tanzania and were deeply impressed, making very favorable comparisons with what they saw and their experience in China.

ZAMBIA

Dates: July 19 through July 21, 1967

Visitors: Mr. H. P. Bradley, Mr. D. Pinck

Visited: Mr. Howard, Director, USAID/Zambia
Mr. Bowa, Under-Secretary, Ministry of Education
Mr. Mulukita, Permanent Secretary, Ministry of Education
Mrs. M. Neville, Education Officer, USAID/Zambia
Mr. R. Yon, Inspector (Science) Ministry of Education
Mr. S. Erlwanger, Inspector (Mathematics) Ministry of Education
Mr. Sibson, Chief Inspector of Schools
Professor Yates, University of Zambia
Professor Rogers, University of Zambia
Professor Ward, University of Zambia
Dr. J. A. Mokoena, Department of Mathematics, University of Zambia
Mr. M. Mumbwe, Ministry of Education

Outcome of Discussions: a) In meeting with the ministry officials requests were made for Entebbe Secondary C One texts for use in six schools in the Southern Provinces. Assistance was also requested for an Institute in January 1968 for some twenty teachers who will be involved in using these texts.

The classes using the Entebbe Primary texts will continue to do so, but all other Zambian classes will be starting on the Zambia Primary Mathematics texts prepared by Dr. N.O.A. Setidisho. These new texts are an adaptation of the Entebbe texts. Zambia is now involved in building up its mathematical strength to ensure adequate supervision of this work. Under the auspices of the local USAID mission, twenty teachers are spending one year in the United States working with people connected with the Entebbe program or with friends who are sympathetic.

At the Ministry meeting the question was raised concerning the use of the Basic Concepts texts in the teacher training colleges.

- b) The new Setidisho Primary texts are being produced under local support by Macmillan publishers. The continuing availability of the Secondary C texts was discussed.
- c) Zambia foresees some problems in introducing modern mathematics into the Secondary schools. A full, well organised teacher education program is in hand. With regard to Primary education it is hoped that the twenty teachers visiting the United States will be able to undertake all necessary supervision and teacher training when they return. Participation in a regional program of mathematics development was discussed.
- d) Mr. Mulikita, the Permanent Secretary, will be attending the

CREDO/EDC meeting. There was also a suggestion that another member of the Ministry should attend.

- e) Despite strenuous efforts it was not possible to obtain political approval for the attendance of the Zambian participants to the Science Workshop in Akosombo, Ghana. Mr. Yon of the Ministry and Dr. Yates of the University are very keen indeed to have a Science Educator appointed to work in collaboration with the Department of Education in the University. It was clear that there is much enthusiasm in the Department of Education and that plans for development are being held up for lack of staff.

It was reported that Mr. J. Wayne Frederick, formerly Deputy Assistant Secretary of State, and Congressman Fraiser of Minnesota visited Entebbe classes in Malawi and stated that they were deeply impressed.

MALAWI

Dates: July 22 through July 25, 1967

Visitors: Mr. H. P. Bradley and Mr. D. Pinck

Visited: Mr. W. Fiddes, Chief Inspector of Schools:
Mr. Lewis Malunga, Assistant Chief Inspector of Schools
Mr. Lawrence Anthony, Assistant Chief Education Officer
Mr. A. Davis, Chief Education Officer
Mr. Vincent Gondwe, Acting Permanent Secretary, Ministry of Education
Mr. Kinnwenda, Inspector of Schools
Miss Roberts, Inspector of Schools
Mr. and Mrs. Chisanga, Ndirande Full Primary School, Blantyre
Miss Chitalo, Std. 2 teacher, Ndirande F.P. School
Mr. A. Phalula, Headmaster, Catholic Institute, Malawi
Mrs. Mgwadira, Std. I & II teacher Catholic Institute
Mrs. Shaba, Std. III teacher, Catholic Institute
Mrs. Mvumbe, Std. IV teacher, Catholic Institute
Mr. M. McKay, Director, Peace Corps/Zambia
Mr. Kumbikano, Science Centre, Domasi

Outcome of Discussions: a) The Anthony-Kazembe adaptation of the Entebbe texts is being produced for the primary schools in Malawi. In the meantime the experimental use of the Entebbe primary texts is continuing. At secondary level the Ministry is considering inviting another modern mathematics program to start experimenting alongside the work with the Entebbe Secondary material. Basic Concepts texts are being used in Teacher Training colleges. Assistance was requested for a course for Primary Teachers and tutors for December / January 1967/68.

- b) The Ministry expressed gratitude for the prompt and adequate supply of texts.
- c) Teacher training problems and problems arising from the adaptation of the texts were discussed. Apparently there is

a need for a resident mathematics educator to undertake some of the tasks of re-educating the teachers. There was also need for a mathematician to supervise the work of adaptation and to assist in courses. Interest was expressed in the possibility of regional appointees helping in Malawi.

- d) The ABC participants are being used in training colleges and in running courses.
- e) Mr. Lawrence Anthony is attending the CREDO/EDC meeting in Oxford.
- f) A visit was made to the Science Centre at Domasi. The enthusiasm of the Malawian students and the variety of work being tackled was most impressive. Officials in the Ministry also commented most enthusiastically about the work of the Centre.

Liberian Mathematics

Report for the Month of June

Submitted to Education Development Center by Don Perardi

Itinerary

| | |
|--------------|--------------------------|
| June 1 | Gbarnga |
| June 2 - 3 | Fizzybu |
| June 5 | Gbarnga |
| June 6 | Palala |
| June 7 - 9 | Monrovia |
| June 10 | Bolahun |
| June 11 | Kolahun |
| June 12 - 16 | Robertsport |
| June 19 | Gbarnga |
| June 20 | Palala |
| June 21 | Ganta |
| June 22 - 23 | Saniquelli |
| June 26 | Salayea |
| June 27 | Fizzybu |
| June 28 | Zor-Zor Central School |
| June 29 | Zor-Zor Luthern Jr. High |
| June 30 | LTI |

SCHOOLS VISITED

On June 1, 1967, we returned to Gbarnga after having spent May 29, 30, and 31 in Ganta, Saniquelli and Saclepea observing classes and helping teachers plan future lessons, improve teaching techniques, and build up their own mathematical backgrounds.

Since Mr. Morris had to go to Monrovia for termination and I was soon to join him to meet the visitors from EDC, I decided to stay close to the Gbarnga area during the first week of June.

The entire day of June 2, we spent observing all the math classes in the double session of the lab school at ZZTI. At 4:30 p.m., I met with each teacher individually and discussed the notes I had taken on his or her lesson plan and presentation. The teachers at this school are using both the Entebbe series and the Addison-Wesley series. They feel that if a teacher can use one of these, then he should have no difficulty with the other; however, the Entebbe series seems to be easier for the students. Mr. Mulbah, the fifth and sixth grade math teacher is doing an excellent job, but he will probably be transferred next year. This will be a loss to Fizzybu, but in the long run, will perhaps do more to promote new math since he will be going to a smaller school further from the road which does not now have the books nor the in-service training available at Fizzybu.

After each teacher had been helped individually, either in this meeting or earlier in the day, the remainder of the seminar was spent in discussing base five on request of the five teachers present. They were very excited and enthusiastic about the similarities between base ten and base five. With this interest aroused, they promised to do some work in base five before my next visit.

June 5th was spent observing the first grade class at the Catholic school in Gbarnga and the eighth grade class at the Methodist school in Gbarnga. This is the first year for the first grade teacher to use the Entebbe books and he is having some difficulty so we planned for him to come to our house in Gbarnga for help. It was encouraging to see the eighth graders at the Methodist school thinking about solving simple equations rather than just going through the manipulations. This is their second year in the Entebbe books and Mr. Achiri has done well in finding the optimum rate of progress of the class.

It is always a pleasure to work with David K. Barrian in Palala. He is using the Entebbe books in grades 1-4. Upon each visit, he has always had advanced lesson plans and usually has jotted down any difficulties he has had since my last visit. He is always open to new ideas and invariably asks for publications on teaching of the new math, or for math texts for himself. We are now investigating the possibility of his taking a correspondence course in higher mathematics either from U.L. or from a school in the States. I observed three of his classes and taught the fourth one myself using his lesson plan.

After school, in discussing his teaching and plans, I was shocked and disappointed to learn that David is seriously considering leaving the teaching field next year to join the army which is a higher paying position. After having taught for ten years, opening a school on his own, and trying to further his own education through self-study and workshops, this Z.T.I. graduate is making only \$45.00 a month. It would indeed be a serious loss to the field of education if this man were forced to join the army for financial reasons.

Mr. John Joanou and Mr. Hugh Bradley from EDC in Massachusetts arrived in Robertsfield on June 7, 1967. The remainder of the week was spent in meetings with these men with the Department of Education, the Peace Corps and in traveling up country to see some of the Entebbe Math classes.

The interest shown by the D.E. in using new math and science materials was furthered by the discussion of the possibility of buying the first and second grade Entebbe books. Both Mr. Bradley and Mr. John Joanou expressed the feeling that these books are better for Liberia than the Addison-Wesley series because of the indigenous nature of the Entebbe series. Another practical advantage of these books is the cost. The first grade pupils text can be purchased for \$.77 a copy thus enabling most students to buy and carry their own copy.

Another main topic of discussion was the proposal for the Math-Science Master Teacher Program. This is the first time the Department of Education has requested such highly qualified people in this field which impressed Mr. Bradley as a sincere effort to improve their math and science education. If this program is implemented, EDC may help to train the math and science master teachers before they come to Liberia. Then perhaps EDC would furnish these people with teacher training materials.

Mr. Bradley and Mr. Joanou commented that the teachers at Bolahun were handling the Entebbe books with ease and confidence. After observing and talking to these teachers we discovered they had a very good understanding of the new approach to teaching mathematics. What was even more encouraging was the fact that they had made this progress mainly through their first year of teaching with the new books with very little training. Mr. Bradley, being very pleased with the manner in which the teachers were handling the math, then offered some other teaching suggestions such as grouping and student-team learning.

After dropping Mr. Bradley and Mr. Joanou at the Ducor after their brief visit at Cuttington College, we traveled on to Robertsport. We spent a week there holding classes for three hours each day. Although the group was small, most of the eight regular attending teachers showed marked improvement in the understanding of the most important ideas in Volume I of the Basic Concepts book used for teacher training in the Entebbe series. This was indicated by the improvement on the text given the first and last day of the workshop. As usual, Prof. Arthur Diggs led the group, but a fifth and sixth grade teacher at the government elementary school, Mr. Robert M. Kemokai, did very well, scoring 91% on a difficult test given the last day.

The week of June 19-23, was spent on the scheduled visits to Gbarnga, Palala, Ganta, and Saniquelli. Since Mr. Morris was writing his end-of-tour report and this was the fourth regular visit to these schools, I spent much of this week and the next in giving demonstration lessons. I talked to: the eighth graders at the Gbarnga Methodist mission; two of the classes at Palala; two classes at the Ganta public school; and spent most of two days teaching in Saniquelli (including a two hour lecture to the eighth graders at the Catholic Mission) since they were especially short on math teachers due to a dedication of a community center and the ill health of Mr. Dave Coleson, a PCV at Saniquelli High.

The result of a meeting with Prof. Char, Dr. Chandler, Mr. Pahn and two senior students was the plan to use these two seniors, Mose Suah and John Riley Gompah, to help teach the lower elementary math classes during the next semester. This idea seems worth suggesting to other schools since some of the High School graduates will be teachers in the near future.

The week of June 26-30 was spent in Fizzybu, Zor-Zor Luthern Jr. High, Zor-Zor Central School, Saleyea, and LTI. Since I had already visited the first two of these schools, I gave several demonstration lessons and held afternoon seminars with the teachers. The teachers at Fizzybu continued their work in base 5 that we had started two weeks prior.

This was my first visit to each of the latter three schools so I spent most of the time observing and offering suggestions when possible. The most fruitful part of a day of observing is always the seminar with the teachers. I was very pleased to see two of the teachers at Zor-Zor Central School: Mrs. Clinton, and Mrs. Kabe Roberts using modern teaching techniques although they were using traditional texts.

The mathematics program at LTI is well organized and the teachers are doing an excellent job as the National Exam indicated last year. Therefore most of my visit at LTI was spent informing the faculty and students of the Entebbe program and making plans for future coordination of our efforts in the field of mathematics.

As a summary of the work of the month, it is necessary to point out the following three areas of difficulty that are common throughout the country:

1. Difficulty of the fifth and sixth graders to understand the relationship between fractions, decimals, and percents;
2. Lack of use of drawings on the part of the elementary teachers to compare and manipulate numbers;
3. Inability of teachers and students to use indigenous materials in the study of Geometry.

To help solve some of these problems, I am in the process of starting a newsletter that will be distributed to all interested math teachers throughout the country. I hope this newsletter will eventually become a cross-fertilization of ideas of math teachers throughout the country through the Department of Education.

Sierra Leone Mathematics

Report for the Month of September

Submitted to Education Development Center by Holly Hollingsworth

Itinerary

Sept. 1 - 9 - Freetown
Sept. 10- Makeni
Sept. 11- Magburaka, Koyeima, Bo
Sept. 12- Kenema
Sept. 13- Njala University
Sept. 14- Moyamba, Freetown
Sept. 21- Port Loko, Makeni
Sept. 22- Magburaka
Sept. 23- Makeni
Sept. 25- Kenema
Sept. 26- Bo
Sept. 27- Njala University
Sept. 28- Freetown
Sept. 29- Freetown
Sept. 30- Freetown

SCHOOLS VISITED

Government Boys' Secondary School, Magburaka

Mr. Victor Johnson is the Acting Principal at this school, and he was also at Mombasa this last summer for the Entebbe Math Workshop. He wanted to start the program with all of his 120 first form students this year. I was able to supply him with Secondary C One textbooks from the Department of Education. Mr. Johnson said he would work closely with his teachers and also try to influence the Government Girls' School, Magburaka to use Entebbe. If they do, he will work with their teachers also. He would also like to assist the math teachers at the Teacher Training College and the Primary School in Magburaka if he could find the extra time. Mr. Johnson is a very friendly person, and I enjoyed talking to him. I'm sure I'll enjoy working with him.

Government Boys' School, Kenema

Mr. L. G. Akow is the principal at this school. It seems that they were doing Entebbe Math before and he decided to start it again in the school with all 114 first form students. Mr. George, a Sierra Leonean Secondary School graduate, will be teaching the classes, and I was able to discuss modern math with him. He was taught traditional mathematics so he was having some trouble with some of the concepts, like different base systems, etc. Part of his problem was that he didn't have a copy of the Teacher's Guide so I gave him the copy that I had. Unfortunately, I was unable to observe his teaching, but he was quite willing to have me observe his classes next trip and offer him suggestions. I will be going back to Kenema during my next trip up-country. Mr. George seems fairly bright but not very interested in staying in the teaching field because of the low salaries.

Government Girls' Secondary School, Magburaka

I talked to a Peace Corps math teacher at this school. She was interested in teaching Entebbe this year, but unfortunately she is teaching mostly English because of the shortage of teachers in that field at her school. She said a British Volunteer is teaching math in the first form to 60 students, and that this teacher likes to use the discovery method of teaching. I left her copies of the textbooks to look over and told her that Mr. V. Johnson could give her any assistance that she might need. I told her, also, that she could get the textbooks for her classes from the St. Francis Boys' School, Makeni, because they had discontinued the program. (See below). I haven't heard anything from them as yet so I'll be stopping by on my next trip.

St. Augustine Training College, Makeni

The Mathematics teacher there, Mr. D. Hinds, is very interested in starting 55 first year students out with the Basic Concepts Textbooks. As of now, Entebbe is not on the Teacher Training College Syllabus so I told him to wait until I had a meeting with The Sierra Leone Mathematics Committee, who I think have a great deal to say about the syllabus. Their Examination is written in Sierra Leone and last year Dr. A. Williams, of Fourah Bay College, drew up the questions.

St. Francis Boys' School, Makeni

I talked to Brother Peter, the Principal, about the Entebbe program that he had had at his school. It seems that the teacher that was interested in it left and they had returned to traditional mathematics. They didn't seem interested in starting it again and the Principal said he would get the textbooks to the Magburaka Girls' School, if they wanted them. St. Francis is noted for having very good exam results, and I was a little disappointed that they were not really interested in improving their curriculum.

Government Boys' Secondary School, Koyeima

Mr. John is the Principal there, and I talked to him about mathematics. He could see no reason to teach or write mathematics for Africans because math is a universal language. I found out later, from one of his teachers, that the Principal doesn't even like African History to be taught in his school.

Hartford School for Girls, Moyamba

I talked to Miss Sue Powell, a new Peace Corps math teacher, about the kind of work that should be done in the first form and some of the problems she should expect in the other forms that she will be teaching. She had left the Peace Corps orientation (see below) before the seminar that I conducted with the new Mathematics teachers. She will be teaching traditional math in her school this year.

Catholic Training College, Bo

Mr. Don Panozza taught Entebbe Math once a week to his classes. He used the Secondary textbooks because he didn't know about the Basic Concepts books. The students were not tested on the material by him or by the exam for the teaching certificate. He thought it pointless to teach sets and number lines because his students already knew how to solve problems by the traditional methods. We had a very good discussion, but I'm afraid I was unable to convince him about the benefits of modern math. He was also disappointed about the Teacher Training Syllabus and last year's examination.

DEPARTMENT OF EDUCATION

I'm assigned to the office of Mr. A. T. Thomas, the Principal Education Officer for Teacher Training Colleges.

I spent a couple of days looking at their files on Entebbe Mathematics and found names of people who have been associated with Entebbe Math. in Sierra Leone. I am going to try to see as many of them as possible in the next month.

The Department of Education gave me an office at the Audio-Visual Center, which is near the Paramount Hotel. They want me to move all the Entebbe textbooks from the warehouse to my office. I'll be doing that as soon as they provide the office with some furniture.

SIERRA LEONE MATHEMATICS COMMITTEE

I've talked to Mr. F. B. Dycke Harding and Mr. J. Jonah, who are members of the Committee, about my assignment, and we are waiting for Dr. A. Williams, Dr. J. Simbo and Mrs. Greene to return from England to have a meeting. It should be around the first week of October. I hope something definite will come out of this meeting concerning Teacher Training Colleges.

Mr. Harding and I talked about the conferences for Entebbe Math to be held during the Easter school break, which is from April 5 until April 18. Harding said he discussed the possibilities of having a lecturer from the States for the conferences with Mr. H. Bradley and Prof. Martin at Mombasa. We are planning to have two conferences, one in Freetown and one in Bo. There are still a lot of details to work out but can you think (or have you thought) about a lecturer for us.

PEACE CORPS CONFERENCE AND ORIENTATION

Peace Corps held a conference for their Volunteers who are teaching in the Primary schools. I attended the math portions of their conference and was able to give them some assistance. I talked to Miss Anna Casey at the conference and though she would really like to teach Entebbe Math, she was afraid that there would be no one to continue the program after she leaves next year.

I also participated in two orientations for new teacher Volunteers that just arrived. One of these orientations was for the 88 Volunteers who trained for Sierra Leone. The other was for 15 Volunteers who trained for Northern Nigeria and came here because their program was discontinued.

Peace Corps is having an In-Country Training Program for the Chiefdom Development workers at Njala University. I talked to two trainees who were interested in working with Primary School teachers in their village. Both are Mathematics graduates and one of them just came from Nigeria where he was teaching Entebbe Math before he had to leave because of the trouble there. I told them I would get some books to them when they get settled in their villages.

I also have spent some time in Makeni and Bo on weekends where some of the

new Peace Corps Primary School teachers come to do their shopping. Many of them are having problems teaching math because they lack experience in teaching and mathematics. I hope I can see some of them in their schools later on.

TRANSPORTATION

Peace Corps assigned me a '63' Volkswagen for transportation. It needs some work done to it, but I think it will be quite adequate for the job. Twice I have had to stop at Njala University in order to do some minor repairs to it. Once I had to have the frame welded where it had been cracked.

FUTURE PLANS

What I do in October will be largely determined by the proposals that are discussed in the meeting with the Sierra Leone Mathematics Committee. I'm going to Kenema and Magburaka again, and I'm going to try to get to some villages near Makeni where the Chiefdom Development people (see above) are stationed.

I'm also trying to write some proposals of my own that could be initiated in Sierra Leone concerning Mathematics Education. These proposals are based on the job description as outlined in the Liberian Entebbe Mathematics Report, but will have more emphasis on self-help, which is in tune with the Peace Corps philosophy. For example, I hope to locate a person, like Mr. V. Johnson in Magburaka, in each area who could assume many of the responsibilities that I have now. Anyway, when I have developed my ideas to a point where they are workable, I will send them to you.

Hugh F. Bradley
11/7/67

AFRICAN MATHEMATICS PROGRAM

FROM INNOVATION TOWARDS IMPLEMENTATION

For more than six years the African Mathematics Program with mainly USAID support has been operating in ten African countries* in a wide-scale attempt to improve mathematical education in African schools from the very first years of school right up to the Advanced Level of the School Certificate Examinations.

INNOVATION

Production of Textual Materials

Under the auspices of the program nearly one hundred fifty African and American mathematicians and educators have prepared mathematical texts, with a very heavy "modern mathematics" bias, for use in African primary and secondary schools and in teacher training colleges. These texts make up three sequential courses or syllabuses - a primary course for classes Primary One through Primary Seven and two secondary courses, one for a four-year course leading to O level School Certificate and one for a five-year course leading to the O level examination. All textbooks in these three courses have appropriate Teacher's Guides which serve a double purpose of explaining the mathematics to the teacher as well as giving advice as to how the material should be presented.

There is also a series of four textbooks for use in teacher training colleges and an Additional Mathematics Course for brighter students who wish to offer themselves for double credit at the O level examination.

* Ethiopia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda, Zambia

An Advanced Level course for the A level examinations will be prepared in 1968. In all, sixty-one volumes have been published for the program.

African Interest

The African countries participating in the program needed no persuading to use the texts experimentally. The new African educational administrators became quickly aware of the changing conditions of mathematical education in the more developed countries and they were anxious to observe, on a limited scale, how suitable the new mathematical content and pedagogy would be in their own countries. There was a hope that by entering the curriculum reform field in mathematics early it might be possible to catch up more quickly on the educational achievements and the technical advances of the non-African countries. Thus, as soon as each of the texts of the African Mathematics Program became available there were early demands to have them tried out in Africa and requests from African countries that courses be given to provide teachers with a sufficient background to deal with the mathematical concepts and new pedagogical thinking written into the texts.

Teacher Training Institutes

As the number of texts has increased and the African Ministries of Education have acquired confidence in the materials, the requests for such courses have increased. By September 1967, thirty-eight courses had been held in the participating countries. Requests for a further twenty-six courses for the next fourteen months have already been received.

Classroom Use of Texts

Since the initiation of the program, some 325,000 texts have been

distributed to meet requests from African Ministries. These requests have now increased to such an extent that the experimental program is having the greatest difficulty in meeting the demands put upon it.

The number of classes using the "Entebbe" texts increases greatly each year. The latest information indicates that 780 primary classes, 630 secondary classes and 260 teacher training classes are presently trying out the new materials. (See Appendix A) The changing pattern of book orders--with increasing emphasis for books for training colleges and teacher training institutes--is a measure of the move from innovation towards implementation.

By 1965 it had become clear that the African Ministries of Education had already decided that "modern mathematics" would be taught in their schools. The factors controlling the implementation of these decisions were lack of teachers capable of dealing with the new materials, lack of people to train these teachers, lack of suitable materials, texts, audio-visual aids and the funds necessary to finance such a basic change in one of the main subjects in the curriculum.

TOWARDS IMPLEMENTATION

These factors inhibiting the widespread use of the Entebbe materials quickly became a matter of concern for the African Mathematics Program and plans were made to deal with the problems which were arising. It was decided that effort must be made in the following areas:

- a) To create a Teacher Education Cadre to deal with the vast program of teacher training (the ABC Institute).
- b) To encourage local country leadership and responsibility for the

spread of the program (the ABC Institute and Relations with African Institutions).

- c) To co-operate with other agencies working in African Education (Interest of other Agencies).
- d) To make it easy for African countries to obtain the materials beyond the needs of innovation by encouraging the publication of commercial versions of the texts and, if necessary, to adapt the materials to suit local conditions (Publications).

The ABC Institute

As a first step to ease the training problem the African Mathematics Program, with Ford Foundation support, organized what came to be known as the ABC Institute. This Institute planned to make available in each of the participating countries a small group of people who, at their own level of mathematical ability and teaching experience, could undertake mathematical leadership in their own countries, organize and participate as lecturers or seminar leaders in training courses in their own colleges or in in-service courses, and act as an advisory body on mathematical curriculum affairs to their Ministries of Education.

The Institute was planned as a two-year activity, beginning with a one-month intensive education in mathematics at a residential course at University College, Nairobi, in July 1966. This was followed by an eleven month correspondence course, the assignments of which were prepared for the participants on almost an individual basis by the lecturers and seminar leaders who had taken them for the residential period. In July 1967 the participants returned to Nairobi for a second month of intensive mathematical education. The eleven month correspondence course which followed

was once again prepared by the residential course tutors. Before the end of the Institute, it is intended that films showing good mathematics being well taught to African children by African teachers, and a source book on topics for teacher education in mathematics, will be available for teacher training purposes. A shorter residential period at University College, Nairobi, will be held in July 1968 to introduce the ABC Institute participants to these aids.

Each of the countries participating in the African Mathematics Program, and one or two others, were invited to send three training college tutors of mathematics (A participants) and a Ministry mathematics supervisor of mathematics education (B participants) to the Institute. African mathematicians from universities (C participants) were also asked to attend as seminar leaders and to help to prepare, supervise, control and distribute the correspondence courses. In 1967 Ministries were asked to send a senior teacher of secondary school mathematics to participate (D participants). Thus it was intended that each country should have an advisory team consisting of a university mathematician, a Ministry official, a secondary school teacher and three training college tutors, all accustomed to working together and helping each other in mathematical affairs. In practice the scheme has been developing well, although it has not always been possible to obtain African university mathematicians able to co-operate. Fortunately, others who have helped to produce the texts have been willing to fill the gap.

Relations with African Institutions

The ABC Institute Program was the first step towards preparing the ground for implementation. At the same time and covering the same period

useful relationships were set up with institutions in Africa which were interested in curriculum reform and concerned about improving teacher education. Perhaps the strongest aid in setting up these relationships was the enthusiasm for the program of the African university people and the Ministry officials and teachers who have participated as writers at workshops or as lecturers or teachers in the teacher training institutes mentioned earlier.

The situations have varied from country to country. In one place close Ministry co-operation has been most effective. In others collaboration with university Institutes of Education or Curriculum Development Centres have proved effective.

Thus in Sierra Leone, with no outside pressure of any sort, local people persuaded the Ministry of Education to set up a Mathematical Advisory Committee. This committee has been supervising local classes in Freetown, organizing teacher training institutes in Freetown and putting steady pressure on the Ministry to send proper people to the ABC Institute and to initiate steps to change mathematical education in schools and colleges. As a result of its efforts the Ministry has asked for Peace Corps co-operation in appointing supervisors to travel up-country to encourage schools to introduce modern mathematics and to help colleges to train teachers for this purpose.

It now appears that the Ministry has decided to move more quickly towards change by using the Peace Corps to work with its Committee and the ABC participants and make up for lack of suitably qualified local personnel.

In Liberia similar initiative was developed at Cuttington College, which encouraged initial experimentation up-country and in co-operation with the San Francisco State University program in Monrovia. As a result

of the efforts of the College a Peace Corps Volunteer was assigned to supervise the spread of the work, to present plans involving seven teams of four people each working in the countries, to run week-end workshops, to visit and to teach in schools and in training colleges.

In Ghana, the Ministry appointed a local officer, who had helped in writing the materials, to supervise experiments, and it now has a full-scale plan to introduce modern mathematics into all training colleges. Peace Corps assistance is being requested. A special feature in Ghana has been the rather heavy university involvement in the spread of the work of the program. Dr. Abbiw-Jackson of the College of Science and Technology at Kumasi has been most active in this respect.

In Nigeria, much of the effort has been due to Dr. Grace A. Williams of the University of Lagos. Dr. Williams, the first Nigerian woman to receive a Doctorate (from Chicago), has supervised and encouraged the spread of the materials of the program in West, Mid-West and Federal Nigeria. Recent troubles in Nigeria have delayed progress, but even in the present distressing conditions courses for 230 primary school teachers were held in Lagos in September 1967. News from the West, Mid-West and Eastern areas is very scanty. By June 1967 the Institute of Education at Nsukka had assumed full leadership and responsibility for the spread of the "new mathematics," had organized courses, initiated experiments with Peace Corps Volunteers and directed and controlled the efforts of the eight ABC participants. In the meantime Mid-West Nigeria has been initiating follow-up plans for courses similar to the one held in 1966. In Northern Nigeria, ministerial control has been weak, but mission schools, acting separately, have been using the materials extensively with apparent intention to increase use as soon as possible. The teacher training program in seven

colleges, supervised by the University of Wisconsin team has been based on the Entebbe materials and has met with considerable success. This latter program may very well be the base for future plans for increased implementation.

The program in Ethiopia, taking a different tack, has reached the implementation stage by Ministerial edict based on a carefully worked out plan for the development of materials and the preparation of teachers. In this plan full co-operation with the Peace Corps, USAID and the African Mathematics Program is being sought. All secondary schools introduced the Entebbe materials this year and by 1969 an Amharic translation of the primary texts will be introduced into all primary schools.

In Tanzania the key word has been co-operation. Since 1964, working on a nine-year plan, the Ministry of Education, the University Institute of Education, the African Mathematics Program and the Columbia University Teacher Education in East Africa program have been developing Swahili translations of the primary texts, running courses for primary and secondary teachers, training college tutors and inspectors and supervising experiments at primary and secondary level. By November of 1967 the new materials were introduced into all primary schools and plans for wide-scale adoption of the secondary materials were well advanced.

In Kenya a different pattern has been followed. There, the curricula reform effort has been controlled by a Curriculum Development Centre staffed mainly by Kenyans with some help from the Teacher Education in East Africa program. The Centre has been responsible for supervising and assessing the merits of the experiments and preparing local adaptations for primary and secondary schools. Their requests for assistance in running courses for teacher training college tutors are indications that the stage of implementa-

tion is approaching.

In Uganda, Malawi and Zambia the efforts have been controlled mainly by the Ministries of Education. In Uganda recently the Institute of Education, with Teacher Education in East Africa staff assistance, has assumed responsibility for mathematical developments in training colleges. In Malawi there has been a tightly controlled but gradually expanding experimentation. On the long term full implementation is intended, but no schemes to deal with the situation have yet been developed. In Zambia after some experimentation with Entebbe materials, by Ministerial edict, it has been decided to introduce into all primary schools a locally developed text. With USAID assistance some twenty mathematics tutors have been sent for one year to study mathematics education in American colleges. Furthermore, some five thousand copies of each of the Entebbe Teacher Training texts have been ordered for training colleges.

Variety of Approach

One striking feature of the foregoing is that no one pattern seems to show itself as being particularly suitable. Each country appears to have assessed its own problems and, being aware of the needs and the outside help available, has developed plans which in each case seem appropriate to the conditions. Perhaps the one feature which does run as a thread through all the efforts is the assistance given by outside agencies.

Interest of Other Agencies

As the success of the African Mathematics Program has become apparent and as the African Ministries and Institutions have made clear their interest in implementation, other educational agencies working in Africa have expressed their desire to co-operate with the Program. As the earlier

stage personnel from these agencies were able to give assistance in making possible adequate experimentation to prove the suitability of the materials. The work of the faculty of Cuttington College, the Peace Corps and the San Francisco State College program in Liberia, the University of Wisconsin Teacher Education Program in Northern Nigeria and the Teacher Education in East Africa program of Columbia are all examples of this sort of help.

More recently the assistance given has been more directed towards implementation. Close and profitable collaboration has been developed with local USAID missions, local Peace Corps operations, and other programs mentioned above. In addition, mutual help has been possible with the Yale University Five-Year Bachelor of Arts program, under which two Yale undergraduates are spending twelve months in Africa working for the spread of the new materials. And perhaps the biggest indication of interest and co-operation is the request that Education Development Center, the parent body of the program, should undertake the training of Peace Corps Volunteers for Ghana, Liberia, Nigeria and Ethiopia. A necessary part of such training would be the introduction of the Entebbe materials to the Volunteers likely to be involved in mathematics education.

The Peace Corps interest also goes much further. African Ministries in Sierra Leone, Liberia, Ghana and Ethiopia are putting great pressure on the Peace Corps to send out Volunteers competent to undertake supervision of the plans for implementation. Help is being requested in three areas:

- a) Appointment of Volunteers to act as teams of circuit riders travelling across the countryside visiting primary schools, secondary schools and training colleges teaching classes, advising teachers and holding week-end seminars on modern mathematics.

- b) Appointment of Volunteers to teacher training colleges to be responsible, with African counterparts, for the setting up of modern mathematics courses in the colleges.
- c) Appointment of Volunteers to secondary schools to introduce modern mathematics and be responsible for the teaching until African secondary teachers become available.

In Sierra Leone and Liberia Volunteers are already undertaking the work described under (a). Volunteers in various countries are also beginning to assume the responsibilities outlined in (b) and (c).

The work of programs such as the San Francisco State College program in Monrovia, Liberia, has been most helpful. In mathematics initially, this program was responsible for the distribution of the Entebbe texts in the city and for the in-service course for teachers. Now, all the schools in the city are using modern mathematics texts and the program is working with local personnel who have been given responsibility for the full implementation of modern mathematics in the schools.

Similarly, in East Africa at the Institute of Education, Makerere, at the Institute of Education, Dar es Salaam and at the Curriculum Development Centre, Nairobi, the Columbia University Teacher Education in East Africa personnel have assumed leadership in organizing courses for tutors and in supervising the wider use of the new materials.

The local missions of the Agency for International Development are also now beginning to be aware that this is an area where funds can be used to good purpose. There is an increasing awareness and sympathy for the African need for help from well qualified mathematical educators and mathematicians as the manpower problems of implementation are beginning to become apparent. It seems likely that USAID help might be particularly useful in this respect.

The massive help given to teacher education by the University of Wisconsin work in Northern Nigeria will certainly speed up considerably the implementation of the reforms. When such work is tied to grass root supervision as proposed for the Peace Corps Volunteers, there seems to be some certainty not only that implementation is possible, but also that it can be carried out at some satisfactory level in a reasonable period of time.

Publications

In the last year or so there have been some indications that the non-availability of the Entebbe books in African bookshops had delayed their widespread use. At the moment the original texts are not available for sale--only for free distribution in limited numbers, for experimental use. That this situation is unsatisfactory is indicated by the private printing in Lagos of some 5,000 copies of the Primary One texts in 1967 and of 15,000 copies of the Secondary C One texts in Ethiopia. It is clear that in these special cases the Ministries concerned have been willing to accept the costs involved in making such a drastic curricular change. It is unlikely that all Ministries will undertake such changes so easily.

The additional cost of the new texts and the heavy recurring costs over a long period which full implementation will make necessary may well act as a deterrent to change. Moreover, as change is likely to be gradual, there will probably be a period for some time when publishing the books may even not be economically wise. To cover both these situations it would seem to be wise to have funds available to subsidise somehow the publisher of the texts until such time as the Ministries can undertake the costs themselves and publishers will have a market which makes publication worthwhile.

As an interim measure the Program has encouraged an English publisher to produce commercial editions of some of the earlier texts. To make such publications financially worthwhile, with the approval of the funding agency, firm orders of considerable size for the books necessary for the completion of the innovation phase of the program were placed in advance of publication.

THE FUTURE

The African Mathematics Program has now reached a turning point in its funding and in its activities. It is already in the phase of changing from experimentation to implementation. By 1968 the production of material will be mainly completed and the experimentation of the early texts has been sufficiently successful to enable African Ministries of Education to make firm decisions about the desirability of change.

Until now the program has tended to think and act on a pan-African basis. Now as countries are making decisions for complete adoption national and regional problems are arising which cannot be dealt with in a pan-African way. Different rates of national development, different economies, different manpower problems, different attitudes to expatriate help and different attitudes to regional co-operation are forcing EDC and USAID to consider the work of the program in a different light.

Under this new light the main problems may remain the same, problems of lack of manpower for teacher education, problems of supervision, problems of lack of materials and finance, but in the new situation--as the description of activities in the foregoing pages has indicated--there will be different answers required for each new situation.

Lessons from Experience

Experience in the earlier work of the program suggests some modes of behavior which may help to bring implementation to a successful conclusion.

- a) It is of the utmost importance that leadership for change should come from local people.
- b) Programs must be adjusted to make full use of local strengths and to bolster areas where there are local weaknesses.
- c) Maximum use must be made of the facilities offered by other educational programs. Co-operation and collaboration can be of tremendous benefit to all parties.
- d) In particular, the Peace Corps can play a vital role in the program of change. Teacher education support is of the greatest importance.
- e) Most African countries will need expatriate help of mathematical educators and mathematicians to assist in teacher education and to supervise the creation of local adaptations of the new materials.
- f) Funds must be made available at local levels to help to finance teacher education, college and in-service and to subsidize publication during the period of change.

Finally, it is our experience that the desire for change in Africa is so great that events will outrun plans. No African country is going to wait for the perfect materials or the perfect situation. Assistance will be most appreciated when it is offered so that the best possible materials are made available to permit change now. African educators, in some ways, are more aware than most people, that education should be changing all the time. They do not want to wait for the perfect situations for change because they know that by that time the materials will probably be no longer suitable.

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PROGRESS REPORT ON ABC INSTITUTE

Introduction

The ABC Institute, an activity of the African Mathematics Program* sponsored by Education Development Center, is financed by a Ford Foundation grant for support of teacher training institutes for the improvement of mathematics teaching in Africa.[†] The Institute is a two year program (1966-1968) which aims to make available in each participating country a core of people who will undertake the supervision of development of curricular reform in mathematics, and who will bring about the necessary re-education of teachers and tutors.

"ABC" refers to the categories of African participants: A-participants are senior mathematics tutors from teacher training colleges; B-participants are the officials in the Ministry of Education who are responsible for mathematical education, or who are likely to assume such responsibility; C-participants are lecturers in mathematics from African universities who have been invited to assist in instruction at the Institute. During the 1967/68 phase of the Institute a D group, consisting of secondary school teachers, was added.

Courses are planned to introduce the ABD participants to the new content and new pedagogy of "modern" mathematics and to improve their mathematical background so that they will be able to act as mathematical advisors to their Ministries, offer leadership in mathematical education and assist in running courses for other teachers and tutors from training colleges. The Institute lasts for a two year period and consists of residential courses in July (1966-67-68), bridged by ten-month correspondence courses. The correspondence courses are taken by the AB and D participants and are prepared, marked and supervised by the C participants.

* See attached Information Sheet.

[†] Ref. letter of January 17, 1956, to Dr. James R. Killian from Mr. Joseph M.

Participation

Participating countries are: Ethiopia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Swaziland, Tanzania, Uganda and Zambia.

The first residential period of the ABC Institute was held at University College Nairobi, Kenya, during July 1966. (See report submitted November 1966). At that time there were 33 A-participants, 7 B-participants, and 9 C-participants. At the conclusion of the 1967 residential period the participation was 36 A-participants, 12 B-participants, 6 C-participants and 17 D-participants; however, eight of these had been unable to attend the residential period because of the troubles in Nigeria.

The Ghanaian Ministry acknowledged that its participants in the 1966 Institute were overqualified for participation, and nominated a new delegation to attend the 1967 Institute. Zambia, which had not in 1966 released any appropriate personnel to participate in the July residential course, by December of 1966 had nominated five participants who began work on the correspondence course in January in preparation for their participation in the 1967 residential period in Nairobi.

1966/67 Correspondence Course

The work done in the correspondence courses between the 1966 and 1967 Institutes was satisfactory. Over sixty percent of the A and B participants who attended the 1966 Nairobi Institute participated in the correspondence course for ten months and returned to Nairobi in 1967. Many who, for personal or other official reasons, dropped out of the program were replaced - in some instances early enough in the year so that the newly nominated participants could begin work on the correspondence course and attempt to catch up.

The correspondence lessons were supervised by the seven C-participants who had attended at Nairobi in July 1966, plus three other mathematicians connected with the African Mathematics Program. Participants were divided into groups according to country or region, and a C-participant tutor from their own area, who had worked with

them at the residential course, was assigned to supervise each group. Most of the tutors called their participants together for one or two weekend seminars during the course of the year to discuss any problems or difficulties which may have arisen with the correspondence work.

Second Residential Course

The second residential period of the ABC institute was held July 2 - 28, 1967, again at University College, Nairobi. Because of the new Zambian participation and the addition of a D group, the number of participants increased from 47 to 63, and would actually have been 71, including one C, were it not for the war in Nigeria which prevented the Eastern Nigerian (Biafran) people from attending.

Participation was as follows:

| | |
|-----------------|----|
| A participants: | 30 |
| B participants: | 12 |
| C participants: | 5 |
| D participants: | 16 |

All participating countries except Malawi had nominated at least one D-participant.

Staff

The following lecturers were engaged to give instruction:

| | |
|-------------------------------------|---|
| Professor Ross L. Finney | Professor of Mathematics, University of Illinois |
| Professor Paul B. Johnson | Professor of Mathematics, University of California at Los Angeles |
| Professor B.J. Pettis (Chairman) | Professor of Mathematics, University of North Carolina |
| Professor Merrill E. Shanks | Professor of Mathematics, Purdue University |
| Dr. Grace A. Williams | Lecturer, University of Lagos, Nigeria |

Dr. A. Beninati of the Institute of Education, Dar es Salaam, Tanzania, and Dr. Rowland C. Anderson of the Institute of Education, Makerere University College, Kampala, Uganda - both members of the Teacher Education in East Africa program -

assisted in instruction. Also present as junior staff members were Mr. Thomas Orum and Mr. Philip Thorne, two mathematics students in the Yale University Five-Year B.A. Program which requires one year of work abroad in one's special field; and Mr. Douglas Shult and Mr. William Bussey, two Peace Corps volunteers from Eastern Nigeria (Biafra) who attended the Institute to prepare themselves to aid those Eastern Nigerian participants who had been unable to attend. However, their return to Nigeria was not feasible and they were subsequently reassigned to Peace Corps positions in East Africa.

Mrs. Mary E. Pettis served as administrator of the residential institute. (See Appendix A).

Work at the Institute

The participants were divided into mathematically homogeneous groups. Those who were new to the Institute formed Group AB 1 (though some of them had done the correspondence work). Professor Johnson worked with this group, with Dr. Williams giving supplementary lectures in methodology. Those who had attended the previous year's Institute formed Group AB 2, though there were two new participants who had sufficient mathematical knowledge to join this group. Professor Finney lectured to the AB 2's, and Dr. Williams instructed them also on methodology. Professor Shanks worked with the D-participants. Seven AB participants also followed the D course because their mathematical ability was adequate and in this way greater benefit could be achieved from their participation.

Professor Pettis lectured to the C-participants, and individual lectures were given to them by the other Staff members and by each other.

Drs. Anderson and Beninati, along with the C-participants, conducted supplementary tutorial sessions with small groups of AB participants.

One additional aspect of the Institute this year was the afternoon National Writing Group sessions at which the participants, divided according to country and supervised by a C-participant or lecturer, devoted their attention to questions and

problems of mathematical education which they might be expected to deal with on completion of the Institute. The work of the National Writing Groups was primarily concerned with critical reading of texts and rewriting of parts of them; comparison of texts; designing parts of a curriculum for primary, secondary and Teacher Training Colleges; planning ways of presenting mathematics in short term institutes for primary teachers or Teacher Training College tutors. It was hoped that the materials produced could be used as a basis for an Institute "Sourcebook" which is mentioned in further detail later.

A report of the Institute and a list of participants are appended. (Appendix B and C).

Correspondence Work 1967/68

For two weeks after the close of the second residential period, the lecturers and C-participants devoted their time to writing the second series of correspondence lessons for the A, B and D participants to follow during the next ten months. The lessons were completed and mailed to all participants during the last week in August.

Ten people have been engaged to supervise the correspondence lessons. These include the five C-participants who were at Nairobi, three of the lecturers, and two mathematicians connected with the African Mathematics Program. (See Appendix D). Four participants (one A, two B, and one D), studying at U.S. universities this year, are continuing with their correspondence work under the supervision of Professor Finney at Illinois.

As of this writing, all of those participating in the correspondence courses have been contacted and asked to inform this office of the status of their work. All replies indicate that they are enthusiastic about continuing with the correspondence lessons and are looking forward to attending the 1968 residential session.

Special Materials

An integral aspect of the overall ABC Program is the creation of special materials and audio and visual aids which might later be used by Institute participants in

in-service courses for their colleagues, and in courses for the mathematical education and re-education of primary and secondary school teachers. In this regard, two main projects are being considered: the creation of an Institute "Sourcebook", and production of teacher training films.

The Sourcebook would be used as a guide and aid in the running of local teacher training institutes. If the material becomes available it will consist of outlines of lectures which were given at the two ABC residential institutes and of plans and suggestions for the content and setting up of in-service courses, and will be distributed to participants in 1968 for their use in helping to run local institutes in their own country. It is hoped that some of the material produced in the National Writing Groups at the 1967 residential course will be suitable for inclusion in the Sourcebook. These materials are being evaluated, and those which are found to be appropriate will be used.

Planning for the production of teacher training films is now well advanced. The State Film Industry Corporation of Ghana has agreed to cooperate with the Education Development Center's Film Studio in the preparation of films which will aim to show, in an entirely African setting, a "good" teacher teaching a class in modern mathematics. Arrangements for filming in Accra, Ghana, under the direction of Mr. John Friedman, a producer from the EDC Film Studios, are now well underway.

Closing Down of the ABC Institute

Plans are being made for the final residential period of the ABC Institute, to take place in July 1968. It was decided to orient this final stage toward primary teacher education, and so participation will be drawn from those A's and B's who will have satisfactorily completed the correspondence course. The intent is to have a meeting of not more than two weeks, to provide a "knitting together" of the two previous summers' courses and correspondence work, and to present to the participants the Primary Teacher Handbook (prepared by the Primary Writing Group of the African Mathematics Program), the teacher training films and, if available, the Sourcebook.

It is also intended to give "certificates of completion" to those attending the final ABC Institute.

Conclusion

It is already apparent that at least some of the objectives of the ABC Institute are being achieved. Already, in some instances, ABC participants are being used to help to run teacher training institutes and in-service courses which Ministries sponsor in their own countries. The report of Professor Vincent Haag of Franklin and Marshall College, who was visiting lecturer at the Mid-Western Nigeria Mathematics Institute in January 1967, is of interest:

"Here was an example of a local mathematician and educator (Dr. Williams) organizing and conducting a teacher training institute for primary teachers with the help of local tutors (the ABC people). . . It should be added here that the ABC people were surprisingly competent in their roles as tutors (surprisingly, because one never ordinarily sees local people at this educational level with such sound mathematical sense). After watching these ABC people at work and after conversations with them it was evident that their experiences in the ABC program in Nairobi last summer made the difference, and that the whole concept of the ABC Program has already begun to pay dividends."

Certainly during the residential periods of the Institute and during visits to Ministries, much enthusiasm has been evident. Not only do the participants appear to feel they are learning much that is worthwhile, but the Ministries also seem to appreciate the value of the work being done.