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PROGRESS REPORT
to the
AGENCY FOR INTERNATIONAL DEVELOPMENT
on the
AFRICAN MATHEMATICS PROGRAM

June 12, 1961 to November 30, 1969

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Education Development Center, Inc.
55 Chapel Street
Newton, Massachusetts 02160
December 1969

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PROGRESS REPORT

This report describes the total activities and production of the African Mathematics Program from inception through November 30, 1969. The body of the report summarizes in fairly brief form the Program's history and development in its main areas of activities: Workshops; Teacher Training Institutes; Book Production; Distribution and Use; the ABC Institutes Program. More detailed information, including numerical count of personnel involvement, activities of the program, production of materials and impact, are given in the Appendices. The Appendices also include detailed description of the main Program activities during the period December 1, 1968 through November 30, 1969.

AFRICAN MATHEMATICS PROGRAM

Background

Education Development Center, Inc. (EDC)* is a non-profit organization concerned with research and development in curriculum reform at all levels of education--from kindergarten to university level. The Ford Foundation, and other U.S.A. charitable bodies, as well as the National Science Foundation, have provided funds for its work. The overseas operations of EDC in Africa, India, Afghanistan and South America have been supported by funds from USAID and from the Ford Foundation and other philanthropic foundations.

In the United States the EDC Physical Science Study Committee Program has brought about a major reform in the teaching of physics at secondary school level, and the effect of this reform is evident in some fifteen countries which also use the textbooks produced by the PSSC working group. Similar EDC programs for the reform of mathematics, social studies and elementary science curricula are presently affecting the educational life of many American children.

* Formerly, Educational Services Incorporated

The African Education Program

In 1961, ESI, under the general direction of Jerrold Zacharias, Professor of Physics at Massachusetts Institute of Technology, organized a six-week meeting at which sixteen African educators and scholars from East and West Africa joined thirty-five American and British counterparts to examine the content of school curricula of many countries of English-speaking Africa.

The Conference made firm proposals that ESI should initiate curricular reform programs for Africa. In particular, programs in mathematics, science, social studies and teacher training were recommended. These proposals were given careful consideration and ESI agreed, initially, to try to act upon a program for the reform of the teaching of mathematics from Standard One up to School Certificate. It was felt that the work of curriculum reform in mathematics in the U.S.A. and in Britain was sufficiently advanced to make possible a positive contribution to African education.

Under the direction of Professor W. T. Martin of Massachusetts Institute of Technology, the program was initiated and, after six months of activity, including conferences in Accra and Ibadan with African mathematicians, a mathematics workshop was held at Entebbe, Uganda, in July and August 1962.

I. THE WORKSHOPS

The first Program Workshop was held at Entebbe, Uganda in 1962. This Workshop set the plan for the African Mathematics Program and the pattern of work which has been followed since. There were fifty-four participants representing 13 countries--with 24 participants coming from 11 African countries. It was decided to produce materials in four areas using the new content and approach to teaching mathematics: text materials for the primary school, beginning with Primary One; text materials for the secondary school, beginning with Secondary One; text materials for use in African teacher training colleges; and tests and examinations based on these materials.

The first Workshop produced a full course for Standard One and Form One and a model of a School Certificate Examination based on modern mathematics, using some objective testing.

In 1963, once again at Entebbe, Uganda, books for Standard Two and Form Two, and for the first year of a training college course were produced. Tests were also prepared for Form One classes using the materials, which were now named the Entebbe Mathematics Series. Each year since then, the number of textbooks has been increased. In 1965 the Workshop was moved from Entebbe to Mombasa, Kenya and has been held there each year since that time.

During the summer of 1969, the Testing Working Group met in Mombasa to revise the Primary Four tests and to consider a syllabus and to prepare specimen examination papers for teacher training colleges and a model examination for the Advanced Mathematics A-level (see Report of the Testing Working Group and Status of Tests, Appendix A).

In 1967, the West African Examinations Council set a School Certificate Examination on the work of the Entebbe Mathematics Series and the Cambridge Examination Syndicate is also offering a suitable examination for East and Central Africa.

II. TEACHER TRAINING INSTITUTES

Early in the Program, it became clear that it was necessary to introduce teachers to the new pedagogical approaches written into the texts and to train them to use the new texts.

Thus far, a total of 69 Institutes have been held. The African Mathematics Program has provided a total of 47 lecturers for these courses. (Listings and descriptions have been included in earlier periodic reports to AID/Washington.) Two Institutes held during December 1969 in Sierra Leone and Tanzania will be included in a later report.

During the period of this report nine Institutes^{*} were held in six African countries (Ethiopia, Ghana, Liberia, Malawi, Nigeria and Uganda) as follows:

TANZANIA

Date: December 9 - 21, 1968

Site: University College, Dar es Salaam, Tanzania

Organizer: Prof. J. E. Phythian, Dept. of Mathematics,
The University College, Dar es Salaam, Tanzania

Director: Prof. J. E. Phythian

Lecturers: Prof. Hartley Rogers, African Mathematics Program lecturer,
Massachusetts Institute of Technology
Prof. C. A. Coulson, Oxford University
Mr. Douglas Quadling, School Mathematics Program lecturer

Participants: 96 secondary school teachers

* See Teacher Training Institutes and Summary Reports, Appendix B.

LIBERIA

Date: January 8 - February 8, 1969

Site: Kakata Rural Teacher Training Institute, Kakata, Liberia

Organizer: Honorable Secretary Caine, Dept. of Education, Monrovia,
Liberia

Lecturers: Mr. Nicholas Schmader, Peace Corps Volunteer
Mr. Samuel Abanobi, mathematics instructor
Mr. Joseph Bettie, Monrovia Consolidated School System

Participants: 20 elementary and junior high school teachers

UGANDA

Date: April 9-12, 1969 A short intensive course for Teacher
Training College tutors, concurrent with
April 9-18, 1969 A fuller course for Grade Three teachers

Prof. Dubisch returned to Uganda June 12-29, 1969 for a
follow-up visit to assist primary teachers in Saturday
In-Service Courses.

Site: National Institute of Education, Makerere University
College, Kampala, Uganda

Organizer: Mr. W. Senteza Kajubi, Director, National Institute of
Education

Lecturers: Prof. Roy Dubisch, AMP lecturer, University of Washington
Prof. L. Feldman, National Institute of Education
Mr. B. Vogeli, National Institute of Education, Nairobi,
Kenya

Participants: Approximately 70 Teacher Training tutors and Grade Three
teachers

GHANA

Date: April 14 - 25, 1969

Site: Girls' Primary School, Accra, Ghana

Organizer: Mrs. Lucy Tagoe, Office of the Chief Education Officer,
Ministry of Education, Accra

Director: Mrs. Lucy Tagoe

Lecturer: Dr. Rowland D. Anderson, AMP lecturer, St. Cloud State
College, Minnesota

Participants: 17 Primary School headteachers, 23 Middle School head-
teachers, 23 Class Six teachers, 25 Class Seven teachers

ETHIOPIA

Date: July 14 - August 1, 1969
Site: Haile Selassie I University, Addis Ababa, Ethiopia
Organizer: Ato Tadesse Terrefe, Assistant Minister Programme, Planning
& Research
Directors: Mr. John Woodcock, Mr. Mark Paulsen
Lecturers: Ato Bisrat Dilnesahu, Mr. Ralph Hughes, Haile Selassie I
University
Participants: 70 Grade Eleven and Twelve mathematics teachers

GHANA

Date: August 18 - 29, 1969
Site: Girls' Primary School, Accra, Ghana
Organizer: Ministry of Education
Director: Mrs. Lucy Tagoe
Lecturer: Prof. Shirley Hill, AMP lecturer, University of Missouri
assisted by Mr. S. Sidney, Yale 5 Year B.A. Program
Participants: 27 Middle School headteachers, 28 Class Seven teachers,
27 Class Eight teachers

MALAWI

Date: August 18 - 29, 1969
Site: Blantyre Secondary School & Limbe Primary School,
Blantyre, Malawi
Organizer: Ministry of Education, Limbe
Director: Mr. Frank Kazembe, Chief Inspector of Schools, Ministry
of Education, Limbe, Malawi
Lecturers: Prof. D. R. Ostberg, AMP lecturer, Northern Illinois
University
Mr. Frank Kazembe
Mr. K. Kawonga, Ministry of Education, Limbe
Participants: 74 primary teachers and college tutors

WESTERN STATE, NIGERIA

Date: August 22 - 30, 1969

Site: University of Ife, Ile-Ife, Western State, Nigeria

Organizer: Mr. M. O. Olaschinde, Secretary, Institute of Education,
University of Ife

Directors: Dr. A. Babs Fafunwa, Director, Institute of Education,
University of Ife
Mr. M. O. Olaschinde

Lecturers: Prof. C. B. Bell, AMP lecturer, University of Michigan
Dr. A. B. Fafunwa
Mr. A. A. Afolabi, Baptist High School, Iwo
Rev. W. A. Compere, Baptist College, Iwo
Chief P. O. A. Dada, University of Ife
Mr. Dapo Onabolu, Federal Science School, Lagos
Mr. G. A. Adeleye, Ikosi Methodist High School, Agbowo via
Ikorodu

Participants: 66 primary and secondary teachers and teacher training
college tutors

LAGOS STATE, NIGERIA

Date: August 25 - September 5, 1969

Site: St. Patrick's R.C.M. School, 356 Herbert Macaulay
Street, Yaba

Organizer: Mr. A. Dahunsi, Chief Education Officer, Lagos City
Council

Director: Dr. Grace A. Williams, University of Lagos

Lecturer: Dr. Grace A. Williams, assisted by other local lecturers and
Mr. Steve Sidney, Yale Five-Year B.A. Program

Participants: 278 Primary School teachers

Institutes last from ten days to three weeks and usually are staffed by visiting American mathematicians and mathematics educators and by their African counterparts who have participated in the Program. They are organized by the Ministry of Education in the participating country with EDC's cooperation. Some 4,700 teachers and teacher educators have been introduced to these materials at Institutes. The children in nearly 2,000 classes in Ethiopia, Kenya, Ghana, Liberia, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda and Zambia are being taught this modern approach to mathematics (see Use of Entebbe Texts, Appendix C).

III. BOOK PRODUCTION

Now there is a full series of textbooks on "new mathematics" for Standard One through Standard Six, with an Entebbe Primary Series Guide, and for Form One through Form Six covering O-level Mathematics, Additional Mathematics and A-level Mathematics courses. A full set of four textbooks is available for use in teacher training colleges (see List of the Entebbe Mathematics Series, Appendix D) and a battery of tests has been prepared covering the work of Standard Three, Four, Five and Form One, Two, Three and model examinations for School Certificate at O-level and A-level (see Appendix A). As a result of reports from teachers and tutors using the texts, the Primary One text and Basic Concepts Volumes I and II were revised and a second Secondary Course, known as the "C" course was prepared.

Recently Published Entebbe Texts

In December 1968 the following Entebbe texts were published: Handbook for Primary Teachers; Additional Mathematics, O-level, Student Text, Vol. 1, Teachers' Guide, Vol. 1.

In March 1969 Primary Six, Pupil Book and Teachers' Guide were completed and in April 1969 Additional Mathematics, O-level, Student Text, Vol. 2 and Teachers' Guide, Vol. 2 were published.

Upon completion these texts were despatched to Africa.

Remaining Entebbe Texts to be Published

Texts presently under preparation include: Advanced Mathematics, A-level, 4 volumes; the Entebbe Primary Series Guide; Mathematics Syllabus Sourcebook for Teacher Training Colleges (see Entebbe Text Production, Appendix E).

IV. DISTRIBUTION & USE OF ENTEBBE MATERIALS

1. Since the Program started, a total of 63 volumes of textual materials has been published (see Appendix D).
2. Some 500,000 texts have been distributed free of charge to the 10 participating African countries (see Total Number of Entebbe Texts Distributed, Appendix F).
3. In the eight year period 186 individuals (African, 102; U.S., 75; British, 7; other, 2) have helped to write the mathematical texts (see Workshop Participants, Appendix G).

4. Nearly 2,000 classes spread over the countries are using the materials experimentally (see Appendix C).
5. During 1968/69 the existing Entebbe inventory was disposed of through bulk shipments to the ten participating countries.
6. Almost 1,000,000 copies of adapted Entebbe texts have been printed by Ethiopia, Ghana, Kenya, Nigeria and Tanzania:
 - a) Ethiopia has decided to publish and introduce Entebbe type materials throughout the school systems, both primary and secondary, and has published 239,000 texts and plans to print an additional 350,000 copies of an Amharic translation of Primary One and Two;
 - b) Tanzania has published its own adaptation of a Primary One and Two text (400,000 copies) and is preparing an adapted mathematics text for use in Form One in the secondary schools;
 - c) Other countries including Ghana, Kenya and Nigeria are extending their use of the texts and have prepared their own adaptations.

(For items 6a, 6b, 6c, see Large Scale Additional Publications of Entebbe Texts Undertaken by African Countries, Appendix H).

Outside Interest

These African-produced materials have aroused considerable interest in other countries. The West Indies expressed a desire to try the books, and similar interest has been indicated in South America and Pakistan. An American adaptation of the texts is available under a trade-name.

A further indication of the interest being shown in the material is the decision of Science Research Associates Limited (SRA, Ltd., Newtown, Reading Road, Henley-on-Thames, Oxfordshire, England) to publish a commercial edition of the following texts:

	(Approximate Prices)	*Reduced Prices
Primary One - Pupil Book	shs 5/6	3/6
Primary One - Teachers' Guide	15/	7/6
Primary Two - Pupil Book	6/6	5/0
Secondary C One Algebra - Student Text	18/	10/6
Secondary C One Geometry - Student Text	15/	9/0
Basic Concepts of Mathematics Volume I	15/	10/6
Basic Concepts of Mathematics Volume II	12/6	9/0

* Effective 1/1/69

More recent interest in the use of Entebbe texts outside Africa include:

Associated Publishers, PTE, Ltd., Hong Kong
Franklin Book Programs, Inc., Iran
(see Interest in Entebbe Texts Outside Africa, Appendices H & I).

V. ABC INSTITUTE PROGRAM

In addition to the in-country institutes described above, the ABC Program, which operated for three summer sessions, beginning July 1966, at University College, Nairobi, Kenya, has concerned itself with the mathematical education of the senior mathematics tutors of the ten participating countries. Its purpose was to develop in each country a small cadre of people knowledgeable about modern mathematics, capable of assisting in the production of adaptations of the materials to suit local conditions and in the mathematical re-education of their fellow tutors, in smaller colleges. These tutors should then, in turn, be able to give suitable training to the teachers in the schools or about to enter the schools (see ABC Institute Program, Appendix J).

Under this program, a pilot teacher education film project has resulted in three films which have been distributed to mathematics tutors who attended the ABC Institute Program. Sixteen audio-tapes on various mathematical topics related to teacher education are presently being prepared. The final task of the ABC Program is the preparation of a Mathematical Syllabus Sourcebook for use in African teacher training colleges and in-service courses. The ABC Program is funded by the Ford Foundation (see Progress Report, ABC Institute Program, Appendix K).

* * *

STATUS OF THE PROGRAM

Planning

It is now clear that all the early experimental aims of the Program have been achieved. All of the participating countries have accepted the idea that "modern mathematics" must be introduced into their school curricula, although just how this should be done may not be clear. Some of these countries are sufficiently involved to have prepared long-range plans to assure the complete adoption of such mathematics throughout all grades and some are making plans for local adaptation of the Entebbe materials.

Executive Committee Meeting

The Executive Committee of the African Mathematics Program met in London, England in April 1969 to review the activities of the Program. The following topics were discussed:

1. Disposal in Africa of entire Entebbe textbook inventory;
2. Production and distribution of teaching aids: films, audio-tapes, Mathematics Syllabus Sourcebook;
3. Pre-publication and production of remaining Entebbe texts and their distribution;
4. USAID/RAC Evaluation of the African Mathematics Program;
5. Cooperation of AMP, African Primary Science Program and African Social Studies Program, to establish an organization which will be responsible for a total African Education Program;
6. Regional Mathematics Programs and resident mathematicians to help implement them.
(See Summary of Proceedings, Executive Committee Meeting, London, April 1969, Appendix L).

Regional Mathematics Meetings

During August 1969 four regional mathematics meetings were held in Accra, Ghana; Lagos, Nigeria; Nairobi, Kenya; and Roma, Lesotho, to discuss the common needs of neighboring countries and the possibility of cooperation in mathematics curriculum reform. Participating countries were: Botswana, Ethiopia, Ghana, Kenya, Lesotho, Liberia, Nigeria, Sierra Leone, Swaziland, Tanzania and Uganda. (Malawi has shown interest in the program but did not participate.)

Consequent to these meetings, draft proposals for three regional programs for East, West and Southern Africa, together with a detailed commitment of each country involved, have been submitted to AID/ Washington (see Summary of Discussions: Accra, Ghana; Nairobi, Kenya; and Roma, Lesotho, Appendices M). The minutes of the Lagos meeting have not yet been received from the Nigerian secretary.

Mr. Hugh P. Bradley, Director, African Mathematics Program, will meet with Ministry officials, USAID Mission and Regional officers to discuss two proposals, on December 30, 1969 at Accra and January 5, 1970 at Nairobi.

Extension of the Current AID csd/1567 Contract

An extension of the current contract beyond 1969, presently under consideration by AID/Washington, will allow the program to complete the printing and distribution of the remaining texts in the Entebbe Mathematics Series and the primary and secondary tests for these books. It will also provide for a visit to Africa by a social scientist to investigate the mode of operation of the program and examine the reasons for its success and failure in different African countries. The results of this inquiry may prove useful when similar educational programs in other underdeveloped countries are being considered. A final endeavor will be the consideration of content needs of a mathematics course at A-level School Certificate for non-mathematicians, for example, the economist, biologist and social scientist.

Co-operation with other Agencies

A pleasing and most useful feature of the Program has been its success in co-operating with other agencies working in Africa. Very effective support has been given to the Program by the Peace Corps in Ethiopia, Ghana, Liberia and Sierra Leone. The Columbia Teachers' College Teacher Education for East Africa Program (TEEA) has interwoven its efforts in mathematical education with our work. Other groups who have worked closely with the Program are: The Harvard/Newton Project at the Aiyetoro Comprehensive School in Western Nigeria, The Yale Five-Year B.A. Program and The Wisconsin University Teacher Training Program in Northern Nigeria. All of these groups have contributed in different degrees to our efforts. Contact has also been maintained with UNESCO, and the United Kingdom Centre for Curriculum Renewal and Educational Development Overseas (CREDO) but not always with the same productive results.

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

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Report
of the
1969 Testing Working Group
and Status of Tests

Introduction

The 1969 Testing Working Group consisting of Dr. D.K. Abbiw-Jackson (Ghana), Prof. R.P. Dilworth (U.S.A., Chairman), Mr. J.E. Jonah (Sierra Leone), Mr. M.B. Jones (Kenya); Mr. J.K. Okine (Ghana) and Mr. R.S. Pieters (U.S.A.) held its summer working session at the Nyali Beach Hotel, Mombasa during the period June 29 - July 19, 1969. Administrative support was provided by Mr. John Joanou of Education Development Center. The principal objectives of the session were the following: review of the Entebbe Primary Four pretest results and appropriate modification of the Primary Four examination, preparation of a Specimen Examination in mathematics for teacher training colleges, preparation of a syllabus for the Advanced Level secondary course written during the 1968 Workshop, construction of suitable specimen examination papers covering the topics in the Advanced Level Syllabus.

Primary and Teacher Training Tests

Messrs. Dilworth, Jonah and Okine formed the subgroup working on primary and teacher training materials. Early this year, as a part of a National Science Foundation evaluation study, the first form of the Primary Four examination was administered in Ghana to eight primary four classes, four of which were using the Entebbe texts while the other four were using traditional texts. The results of this examination were analysed statistically by the School Mathematics Study Group at Stanford and the item analyses were made available to the Testing Group. A study of these item analyses showed that the test was somewhat too difficult and that a few of the questions failed to be effective. The latter questions were replaced and a number of the remaining problems were simplified in order to make the examination less difficult. Similar modifications were made in the parallel form. Thus the two forms of the Primary Four Examination are now ready for reproduction and distribution.

During the 1968 Workshop the Testing Group prepared a few essay questions covering materials in the Basic Concepts Series. Additional questions of the same type which would be suitable for a teacher training examination were composed this summer. From this pool of questions, a 2½ hour specimen paper was prepared. The paper consists of eight essay questions of which the candidate will be expected to attempt seven. It was the decision of the 1968 Workshop that the teacher training examination should also contain a 2½ hour paper covering appropriate topics from the secondary curriculum. Accordingly, the collection of secondary questions prepared in previous years was surveyed and those suitable for a teacher training paper were selected. From this subcollection a 2½ hour paper

was prepared. It consists of two sections: a 1½ hour section of 30 short answer questions and a 1½ hour section of 40 multiple choice questions. The two papers together comprise the Specimen Examination for use in the teacher training colleges.

Secondary Tests

Messrs. Abbiw-Jackson, Dilworth, Jones and Pieters formed the subgroup working on secondary test materials. As a first step in formulating a syllabus, the advanced level test written at the 1968 Workshop was reviewed and a detailed list of topics prepared. A set of priorities was established so that the topics could be grouped into suitable categories. From this grouping a draft of the syllabus was prepared.

In view of the limited time available, it was decided that two papers would be prepared, each covering, so far as possible, the full range of topics in the syllabus. The first paper would consist of multiple choice questions while the second paper would have essay questions. The group then devoted several days to the construction of questions of both types covering the topics of the syllabus. From this pool of questions, 40 multiple choice questions were selected to make up a two-hour paper. Ten essay-type questions were also selected to make up a three-hour paper in which candidates would be expected to attempt eight of the ten questions. The syllabus and the two papers will be submitted to the Chairman of the A-Level Writing Group for review.

Status of Tests: please see following page

Status of Tests

Primary

Primary Three: The statistical analysis of the results of the pre-testing has been delayed. The West African Examinations Council has just informed us, after much delay, that, because of its present work load, it will be unable to undertake this task in the foreseeable future. Alternative plans are being considered.

Primary Four: Two parallel forms are now ready for reproduction and distribution.

Primary Five: Two parallel forms are ready for pretesting; will be reproduced and sent to Ghana as soon as possible.

Specimen Primary Leaving Examination: Copies have been distributed to the West African Examinations Council and to the appropriate Ministries.

Secondary

Secondary C-One: Test #1 has been pretested and revised. It is available for distribution. Copies of Test #2 have been sent to Professor J.E. Phythian, The University College, Dar es Salaam, Tanzania, for pre-testing. When the results are received it will be revised and made available for distribution.

Secondary C-Two: Two tests have been pretested and revised. They are available to the African classes completing the Secondary C-Two texts.

Secondary C-Three: Two tests have been prepared. Copies will be sent to Prof. Phythian as soon as possible for pretesting.

Secondary C-One-Two-Three: Two revision tests covering the Secondary C Course were prepared in 1968. If there is to be general use of these tests in Tanzania, the results of the first administration should be used as pretest data and the tests revised accordingly.

Additional Mathematics: Syllabus and specimen examination has been reproduced and distributed to the West African Examinations Council and the appropriate Ministries.

Advanced Mathematics: A syllabus and two specimen papers have been prepared. After review by the Chairman of the A-Level Writing Group, the syllabus and specimen paper will be distributed to the West African Examinations Council and appropriate Ministries.

Teacher Training

Two 2½ hour papers, one consisting of essay questions and the other having short answer and multiple choice sections have been prepared. These papers are intended to be used at Teacher Training Colleges where the mathematics course is based upon the Basic Concepts Series and the Handbook for Primary Teachers. These tests will be distributed to appropriate Teacher Training Colleges.

Conclusion

All of the tests originally contemplated in connection with the African Mathematics Program have now been constructed. Some modifications will be required for some of the tests but the principal tasks of the Testing Group have now been completed.

Professor R.P. Dilworth
California Institute of Technology

Most of these tests are ready for wide-scale use in the event of the proposed regional plans being funded. Some can be used as a basis for additional work by the Regional Evaluation Group.

Teacher Training Institutes
and
Summary Reports

Ethiopia

6 Institutes
5 Lecturers

Ghana

10 Institutes
11 Lecturers

Kenya

3 Institutes
1 Lecturer

Liberia

5 Institutes
1 Lecturer

Malawi

4 Institutes
4 Lecturers

Nigeria

*21 Institutes
12 Lecturers

- * a) G.A. Williams On-Going
double Institute
- b) 278 participants attended
the Primary Institute at
Lagos. Triple Institute

Sierra Leone

6 Institutes
2 Lecturers

Tanzania

8 Institutes
5 Lecturers

Uganda

4 Institutes
4 Lecturers

Zambia

2 Institutes

2 Lecturers

Total Number Institutes held since December 1963 to date	69
Total Number of Lecturers	47
Total Number participants (estimated)	4,700

Institutes Scheduled to December 31, 1969

1. Sierra Leone - Primary Teachers - Professor Ross L. Finney, AMP lecturer - December 8-19, 1969
2. Tanzania - Secondary School Mathematics Teachers - Professor Bartley Rogers, Jr., AMP lecturer - December 8-19, 1969

Note:

1. Lagos, Nigeria - On-Going Institute: 12 teachers, Saturday Entebbe Classes - G.A. Williams

Summary: Report by Prof. Hartley Rogers on the Teacher Training Institute
at University College, Dar es Salaam, Tanzania
December 9 - 21, 1968

A. Purpose

This was the fourth Institute for secondary teachers in Tanzania teaching Entebbe mathematics. The purpose of this course was to further improve their knowledge of modern mathematics and methods of teaching the Entebbe materials.

B. Participants

Ninety-six secondary teachers attended the Institute. Many came with the permission, encouragement and sponsorship of the Tanzanian government. Very roughly, about one third of the participants were African, one third of Asian ancestry and about one third of European ancestry.

C. Organization

The Institute was organized by Professor J. E. Phythian, Head of the Department of Mathematics at the University College. Professor Hartley Rogers, Massachusetts Institute of Technology, was the AMP lecturer, assisted by Professor C. A. Coulson of Oxford University and by Mr. Douglas Quadling, the SMP lecturer.

D. Program

Lectures were divided into two streams. The first or "A" stream, was intended for teachers whose primary teaching responsibility was in the first two years of secondary school. The second or "B" stream, was intended for those teaching in the last two years of secondary school.

Lectures on algebra, given in "A" stream, involved basic number concepts and operations. At this level, concepts of probability and statistics were presented as well as an axiomatic approach to geometry, concepts and ideas of geometrical proof, symmetry and transformations.

"B" stream lectures dealt with vector mechanics, co-ordinate geometry, numerical methods, phases of probability and statistics and logic. Lectures in both streams were delivered at each morning session; participants were free to choose the lectures they wished to attend.

Additional lectures, reports and films were presented to supplement major lectures. I conducted two-hour book discussions daily. Participants read and discussed several Entebbe texts.

The schedule was a physically demanding one for me. The hot and humid climate made activity quite tiring. My duties were significantly heavier than those of the other chief lecturer, Mr. Quadling (15 lectures as opposed to 10).

Special mention must be made of the two Americans on the University mathematics staff, Dr. Alvin Beninati and Dr. Charles Mullins. They played especially sympathetic and helpful roles throughout the Institute.

Prof. Hartley Rogers, Jr.
Massachusetts Institute of Technology

Summary: Report by Mr. Nicholas Schmader, Peace Corps Volunteer, on the Teacher Training Institute at Kakata Rural Teachers Training Institute, Kakata, Liberia, January 8 - February 8, 1969

This was a course for pre-secondary school teachers using Entebbe materials.

The main people responsible for organization were Mssrs. Don Perardi and Jon Hanshew, Peace Corps Volunteers. There was a degree of confusion here because Mr. Perardi was in the process of leaving as the Entebbe Mathematics Coordinator and Mr. Hanshew was just becoming oriented to this post. EDC provided financial assistance.

The Department of Education provided the lecturer, Mr. Samuel Abanobi, who was assisted by Mr. Nicholas Schmader, PCV, and Mr. Joseph Bettie of the Laboratory High School, Monrovia.

We three instructors were all using Entebbe books in our classes and we had enough books to supply each student with a copy. I would classify the levels of the courses somewhere in the high school range. Here is a list of the lecturers and their subject matter headings, in broad terms:

Mr. Samuel Abanobi - Number Theory

The text used in his class: Basic Concepts of Mathematics, Vol. II.

Mr. Nicholas Schmader - Plane Euclidean Geometry and Coordinate Geometry

The texts used in my class: Basic Concepts of Mathematics, Vol. III and Secondary C One Geometry.

Mr. Joseph Bettie - Set Theory and Graphing

Mr. Bettie was kind of free-lancing. He taught in the period between Abanobi and me, and he tended to pull things together for the class. Mr. Bettie was the real leader and is an excellent instructor.

There were only twenty students who regularly attended the classes. In one way this was fortunate because we could accomplish more with a small class. This poor turnout does not reflect any apathy on the part of Liberian teachers. Since February I have met a number of teachers in rural areas who had wanted to attend the Institute, but a lack of communication prevented them from doing so.

1. Content of the Lectures

Naturally, in an introductory course on plane Euclidean geometry, the first lectures must contain some discussion of what we try to mean by point, line, plane, line segment, ray and angle. After that I tried to introduce some of the assumptions (postulates) in order that we

could move to the idea of proving things. After examining notions of proving theorems, I began to spend a little time each period on coordinate geometry. I did this because I wanted to show how algebra and geometry can be tied together.

The problems assignments which I gave were mostly from the two texts mentioned previously in this report.

2. My Own Estimate of My Success in Communicating with the Participants

I feel I had considerable difficulty here, because there was somewhat of a language barrier. This was especially true when I was talking about the notions of point, line and plane. I was using adjectives which some members of the class interpreted differently from me.

Fortunately this class was very curious and was not at all hesitant to ask questions. Thus, in many cases, we did see what the other was talking about.

3. Assessment of the Quality of Other Parts of the Course

As far as my choice of subject matter goes, I think that I chose wisely. I feel, however, that I may have tried to do too much too fast. Although some students may not understand much of what I lectured on, at least I helped them build some kind of mathematical vocabulary. This will help them if they read texts on their own.

4. The Extent to which Participants Will Be Able to Use the Mathematical Knowledge Obtained in the Course

Since almost all of the participants were elementary or junior high school teachers, the best use of the knowledge that they gained will be in their teaching. With a better knowledge of mathematics, they might become better teachers of that subject.

I do not know what the long range career goals of all of the participants are, but if some of them take up technical careers, the Institute may have given them an improved mathematics background.

5. Some Comments on the Organization of the Course

I had an overall plan of what I was going to do, but since the class usually asked questions when they did not understand something, they sometimes put a new direction to the classes. Organizing was difficult because the participants had widely varying mathematical backgrounds.

Mr. Bettie organized a problem session from 4:00 to 5:00 o'clock every day. We three instructors took turns conducting these sessions. During this period, Mr. Bettie sometimes concentrated on methodology. He did this by making each student take fifteen minutes to introduce a concept as they would to a grade school class.

6. Many times Mr. Bettie interjected a good deal of humor into the Institute. This tended to break the monotony of five hours of mathematics each day.
7. The KRTTI did not really know too much about these Institutes. Consequently they could not help too much. They did, however, provide the classroom and living quarters.
8. These are the three outstanding participants:

Mr. Harris K. Flomo
Mr. Patrick Davis
Mr. Joshua Cleon

Nicholas Schmader
Peace Corps Volunteer
Monrovia, Liberia

Summary: 1) Report by Prof. Roy Dubisch on two concurrent Mathematics Courses for Teacher Training tutors and for Grade Three teachers at the National Institute of Education Makerere University College, Kampala, Uganda April 9-12, 1969 and April 9-18, 1969

2) Follow-up visit to assist primary teachers in Saturday In-Service Courses, June 15, 1969

1. These courses were requested by Mr. W. Senteza Kajubi, Director, National Institute of Education, Makerere University College, Kampala, and organized by Mr. F.A. Fogarty.

In addition to Prof. Feldman and Mr. Vogeli, I was ably assisted by Mr. E. Karuhige, a graduate student and tutors, N. Albright, C. Polcyn and H. Kaboggoza.

In my work with both tutors and primary teachers, I stressed the importance of considering, in a short course, just a few basic ideas directly applicable to the needs and interests of the teachers rather than attempting a "Level I" course. Thus, for example, I considered only the most rudimentary notions about sets as applied to addition of whole numbers rather than fussing with the algebra of set union and intersection.

Then I concentrated on a few algorithms, emphasizing the role of student participation, rather than attempting anything like a systematic survey of arithmetic. I also stressed (through examples) the importance of number games and patterns in developing student insight and interest.

Throughout the ten days, this course was related to the in-service course they will (we hope) begin in May and they were cautioned frequently by both Dr. Feldman and me to go slowly and not attempt to cover too much.

A set of ten Saturday courses will be mounted in the area of each teacher training college beginning mid-June, 1969. I will visit as many of these courses as I can during my return trip in June.

2. At these sessions participants who had attended the Institute gave mathematical presentations to the others present and this was followed sometimes by demonstration lessons to pupils and finally, after discussions and presentations a final mathematical presentation by me. The quality of the participant presentation varied from good to very poor, but much enthusiasm was apparent and it was clear that the process could work satisfactorily if there was sufficient supervision from the local training college tutor.

I would make the following suggestions:

1. A fairly detailed outline of the course together with cyclo-styled material, must be prepared for use by the teacher.
2. The course must be confined to a very few basic concepts which the primary teacher will find immediately significant. It does the teacher only harm to be given a hasty look at a variety of sophisticated concepts poorly presented by teachers whose own understanding of the concepts is, at best, hazy and, at worst downright erroneous. In particular, I would recommend that, in addition to a consideration of the metric system, attention be focused on the basic ideas underlying the algorithms of the arithmetic of whole numbers. I would urge that work on sets be strictly confined to the bare essentials necessary to introduce addition and subtraction in terms of sets - and without symbolism such as the use of {} and U.
3. Some supervision will, I think, be necessary by tutors and it would be extremely helpful to have someone at Makerere or the Ministry to help plan these in-service institutes, be available for advice when needed, and to make at least spot inspections of the courses.
4. The long run need, of course, is for a set of good primary texts together with teacher's guides for these. As long as inadequate texts are the only ones available, progress will necessarily be very limited.

Prof. Roy Dubisch
University of Washington

Summary: Report by Prof. Rowland C. Anderson on the Teacher Training Institute
at Girls' Primary School, Accra, Ghana
April 14 - 25, 1969

A. Purpose

The course was designed to provide a background in modern mathematics for teachers using the Entebbe Primary Six books.

B. Participants

In all, there were 88 participants. This group was made up of 17 Primary School headteachers, 23 Middle School headteachers, 23 Class Six teachers and 25 Class Seven teachers.

C. Organization

The Institute was organized by Mrs. Lucy Tagoe of the Ministry of Education, Accra. EDC assisted financially and provided the AMP lecturer, Prof. Rowland C. Anderson of Saint Cloud State College, Minnesota.

D. Program

A brief introduction was given to set language, its use and importance in the various aspects of mathematics. Since Primary Six mathematics uses operations with whole numbers, integers, and rational numbers, these systems were presented in some detail. The emphasis was on trying to show how each system was a necessary extension of the preceding ones. The operation properties of closure, commutativity, associativity, distributivity, identity elements and inverses were presented as a basis for making the operations understandable and reasonable.

The number line was used extensively to demonstrate the relation of the number systems and to help illustrate the operations and their properties. To promote a better understanding of the decimal system of numeration and the importance of place value in the operation algorithms, the uses of the numeration systems with bases other than ten were discussed.

Clock arithmetic was introduced to help the teachers further understand the nature of arithmetic operations and their properties. The basic ideas of geometry were presented in terms of "sets of points" language. Motion geometry was introduced - translations, rotations and reflections.

Instead of straight lecture, an effort was made to keep the class involved, both by asking questions on the material as it was developed and by encouraging questions from them. Occasionally it became evident in the discussion sections that certain topics were not understood or were misunderstood. Such topics were reconsidered, revised and presented in a simpler form and this was apparently appreciated and worth the time and effort.

In so far as possible the lectures referred to specific units or sections of the Primary Six book. This gave the class a feeling that "this we will have to know and use" and also provided specific problems for the discussion sections.

By the end of the two weeks there seemed to be a general understanding and interest in the materials. It would be wishful thinking and self-delusion to assume that all participants finished the course with complete understanding and competence. The overall response, however, was very encouraging. Most of these people will be able to do a reasonably good job in teaching the Primary Six materials. They will need additional help and encouragement.

Prof. Rowland C. Anderson
Saint Cloud State College

Summary: Report by Ato Bisrat Dilnesahu and Mr. Ralph Hughes on the Entebbe Secondary C Three and Four Mathematics Institute at Addis Ababa, Ethiopia, July 14 - August 1, 1969

This Institute, requested by Ato Tadesse Terrefe, Assistant Minister Programme, Planning & Research and Mr. John Fitzgerald of the Curriculum Department, Ministry of Education and Fine Arts, was held at the Haile Selassie I University, Addis Ababa, Ethiopia. Mr John Woodcock and Mr. Mark Paulsen, both from the Ministry of Education administered the course.

Mr. Ralph Hughes and Ato Bisrat Dilnesahu, staff members at Haile Selassie I University were the principal lecturers at this Institute. The lecturers in geometry and statistics were given by Mr. Hughes and the lectures on algebra were given by Ato Bisrat Dilnesahu. Topics covered in the lectures included: rigid motions, functions, relations and their graphs, coordinate geometry, polynomial functions, trigonometry, rational functions and statistics.

There were 70 participants who were mostly 11th and 12th grade mathematics teachers in the Secondary Schools throughout the Empire. Tutorials were conducted by:

Miss Nancy Polich
Mr. Larry Wells
Mr. Ron Nickel
Mr. Mark Paulsen
Ato Zebenigus
Ato Mulugeta.

The results of the course, generally speaking, was a satisfactory one. However, the lecturers would like to make the following remarks on the program as a whole:

- (a) Generally the participants did not have any previous acquaintance with modern mathematics and hence could not follow the lectures with ease.
- (b) The period for the whole course was rather short and did not give the participants enough time to assimilate the material that they had to do in this time.
- (c) Since most of the participants were foreigners recruited on contractual basis, usually for three years, they were not strongly motivated to learn new material.
- (d) A large majority of the participants were educated in "traditional" mathematics and would have experienced much difficulty in adjusting to the curriculum had they not taken this summer course.

Ato Bisrat Dilnesahu
Mr. Ralph Hughes
Haile Selassie I University

Summary: Report by Prof. Shirley Hill on the Teacher Training Institute
on Entebbe Primary Five and Six at Accra, Ghana
August 18 - 29, 1969

The Institute was organized by Mrs. Lucy Tagoe of the Ministry of Education, Accra. The AMP lecturer was Prof. S. Hill, University of Missouri, School of Education, Kansas City, Missouri. Mr. S. Sidney of the Yale Five-year B.A. Program assisted in the tutorials.

Participants at the Institute included 27 Middle School headteachers, 28 teachers of Class Seven and 27 teachers of Class Eight.

Material from the Primary Five and Primary Six books was covered. Specifically, I lectured on all material described in the plan for the seventh year of an eight-year program, except units on collecting and organizing data and geometric drawing. The time allotted was insufficient to cover the entire syllabus. I felt that instructions in the Teachers' Guide were explicit enough for the units not dealt with to enable the teachers to cope with these units without additional mathematical background. All units on the arithmetic portion of mathematics, on geometry (including motion and coordinate geometry), and on measurement were treated in the lectures.

The time schedule was separated into alternating hour lectures and tutorials. Two lectures and two tutorials were led by headteachers who had attended previous Institutes. I was impressed by their competence and by the fact that they had volunteered their time without compensation. The Entebbe Program has a large and growing number of devoted supporters among headteachers and primary teachers in Ghana. The Program is well organized and supervised by Mrs. Lucy Tagoe and her assistant, Mr. Fianko.

Since Mrs. Tagoe was on maternity leave the course was organized and administered by Mr. Fianko. Mrs. Tagoe was present during the last week. We were also pleased to have the assistance of Mr. Steve Sidney who came from Lagos for the first week. Several education officers visited the Institute at various times.

I like the organization of these Institutes. One can certainly accomplish more in a residential course, but the schedule makes the most of the time allotted in the commuter arrangement. Tutorials were extremely important and it is crucial to have good personnel for these. The teachers prefer to use tutorial time to follow up on lectures by going through problems in the pupils' books, which contain material covered in the previous lecture. I feel that lectures are best received and most beneficial if they follow the content of the books rather closely and if references are made to the particular activities of the books.

In general, I feel that the Institute was a successful one. Interest was high and a great deal of material was covered without treating it superficially.

Prof. Shirley Hill
University of Missouri

Summary: Report by Prof. Donald Ostberg on the Teacher Training Institute
at Blantyre, Malawi, August 18 - 29, 1969

This was a course for primary teachers and college tutors using the Entebbe materials.

As in the past the Institute was sponsored by the Malawi Ministry of Education in cooperation with EDC. The lecturers conducting this year's Institute were:

Prof. D. R. Ostberg
Department of Mathematics
Northern Illinois University
DeKalb, Illinois

Mr. K. Kawonga
Ministry of Education
Limbe, Malawi

Mr. F. Kazembe
Ministry of Education
Limbe, Malawi

Preparations for the Institute were made by Mr. Kazembe who, as usual, did an excellent job. A total of 74 teachers attended as participants.

The daily activity of the Institute was divided among lectures, tutorials and practical work, altogether six hours of scheduled activity. The lectures were attended by all participants, while the tutorials and practical work were structured by grade level. On the average, three hours each day were spent in lectures, two hours in tutorials and one hour in practical work. Many of the participants continued with practical work beyond the regularly scheduled hours.

In the main, the lectures were devoted to a systematic discussion of the number system, beginning with the natural numbers and progressing through the integers to the rational numbers. Simple arithmetic computations were stressed throughout, both for their own sake (the teachers need this type of work) and as illustrations of the ideas being treated. In fact, at least half of each lecture was given over to problem solving. The participants seemed to enjoy this activity and would often request that it continue even when, in the opinion of the lecturer, things were getting a bit dull. The Institute ended with a number of lectures on functions, approached from the point of view of operations on numbers. An attempt was made to explore the idea of constructing complicated operations out of simple ones and decomposing a complicated operation into simpler components. The connection with algorithms was stressed, and operations in other areas, such as computer programming, were mentioned.

On the whole I would assess the lectures as a success, though there were participants who found the material too difficult at times and others who

found it too easy throughout. But this is inevitable when dealing with a group as large and diverse as this one was.

It was clear that a substantial number of the participants had a much firmer grasp of the structure of arithmetic after completing the course than they had at the outset. Although many of the participants had attended previous Institutes where much of the same material had been discussed, it was obvious that they profited by going over the same ground again. Indeed, this repetition was of such obvious value that I would strongly recommend that it become a standard feature of continuing Entebbe Institutes, at least for primary teachers. In particular, if another such Institute is held in Malawi I would urge that the principal lecturer again devote at least half of his lectures to this topic.

This year the number of tutorials was almost double what it had been in the past, a significant improvement in my opinion, and one that was welcomed by the participants. Under the schedule followed there was ample time to answer specific questions on the text material the teachers will be covering in the year to come and still discuss - in broad terms - the reasons for presenting it and the mathematical issues at stake. This is especially critical for materials such as geometry and approximations, and graphing, which perplexes many of the teachers because of its unfamiliarity.

Judging from conversations both overheard and deliberate, plus the outward reaction of a clear majority of the participants, these Institutes are extremely popular in Malawi. In addition to the obvious benefit derived from the formal work of the Institute, the teachers gain a great deal from the opportunity to meet colleagues and discuss mutual problems. In a country such as Malawi, where travel is difficult and communications relatively primitive, such contact is extremely important. For this reason, if for none other, I would recommend that this program be continued.

While offering what may well be gratuitous recommendations, there is one pertaining to the structure of the Institute itself that I would urge be given serious consideration. I believe it is unwise for a lecturer to undertake too heavy a load of subject matter and expect to reach an audience of teachers ranging from Primary One to teacher training college level. In my opinion much more could be accomplished if the participants were divided into two groups, one comprising the teachers from Primary One through Primary Three, the other teachers from Primary Four onward, each of which would be given a separate series of lectures. In that way the lectures could more nearly be designed to fit the needs of all participants. At the same time, for the reason cited in the preceding paragraph, I feel that each Institute should include teachers from all grade levels. Thus, were this recommendation to be adopted, it would imply inviting two lecturers from the U.S. to participate in a single Institute, rather than only one. If funds could be found, I am convinced that the rewards would be well worth the additional expense.

This report would certainly be incomplete without mention of the able assistance given throughout the Institute by Mr. K. Kawonga and Mr. F. Kazembe. Mr. Kawonga, a former ABC Participant, gave daily lectures and tutorial sessions. He was certainly well received by the participants, and obviously did a very fine job. Needless to say, the same is true of Mr. Kazembe. The care he took in organizing the Institute and the efforts he expended in making the participants comfortable were largely responsible for the success of the Institute.

Professor Donald R. Ostberg
Northern Illinois University

Summary: Report by Prof. Charles Bell on the Teacher Training Institute at the University of Ife, Ile-Ife, Nigeria, August 22 - 30, 1969

A. Purpose

The course was designed to provide a background in modern mathematics for primary and secondary teachers and teacher training college tutors.

B. Organization

Dr. A. Babs Fafunwa, Director of the Institute of Education, made the necessary arrangements. EDC provided financial assistance and the AMP lecturer, Prof. Charles Bell, Mathematics Department, University of Michigan.

C. Participants

A total of 66 participants attended the Institute. They were divided into two groups. Group A was made up of teachers from secondary schools; Group B was made up of teachers from primary schools and teacher training colleges.

D. Lecturers, Topics, Audience Level

Prof. C. B. Bell	- Geometry, Statistics	- All groups
Mrs. B. Osibodu	- Number Theory, Open Sentences	- Sec.
Mr. A. A. Afolabi	- Open Sentences	- Prim. & TTC
Rev. W. A. Compere	- Set Theory, Logic, Theory of Functions	- Sec.
Chief P. O. A. Dada	- Sets	- Prim. & TTC
Mr. Dapo Onabolu	- Groups, Rings, Vector Spaces	- Sec.
Mr. G. A. Adeleye	- Directed Numbers	- Prim. & TTC

E. Evaluation

In general I think communication was good. The students were well-acquainted with the subject matter of the first half of the lecture series I delivered. The primary teachers and the training college tutors were introduced to matrices in coordinate geometry; all were introduced to statistics in my other lectures.

The staff continually discussed the course and the general opinion was favorable. The quality of the lectures was impressive and students were free to ask questions. This course enables the teachers to use more new mathematics by reinforcing their knowledge and providing some text material.

Mr. Sunni, a headmaster and a mathematics teacher, was an outstanding participant. He has been a member of a Nigerian writing team in the mathematics field.

F. Participant Reaction

- (1) All participants seemed to want more Entebbe books of one type or another.
- (2) While discussing possible writing projects in Nigeria, several participants suggested that fewer words be used, since English is the second language of most children.
- (3) The participants expressed a desire for two (free) coffee breaks per day.
- (4) They also expressed a desire for the Institute instructors to dine with them more often.

Prof. Charles Bell
University of Michigan

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Summary: Report by Mr. G. A. Borisade, Assistant Education Officer of the Modern Mathematics Vacation Course for Teachers in Lagos Primary Schools August 25 - September 5, 1969

(This course, requested by Mr. A. Dahunsi, Chief Education Officer, Lagos City Council Education Department, and directed by Dr. Grace A. Williams, University of Lagos, and a member of the Steering Committee of the African Mathematics Program, was held at St. Patrick's R.C.M. School, Herbert Macaulay Street, Yaba.)

Opening

The seminar was formally declared open by Mr. A. Dahunsi, the Chief Education Officer (L.C.C.) at 9:00 a.m. on August 25, 1969. In his opening speech, the Chief Education Officer noted with appreciation the spirit of self-sacrifice, enthusiasm and keen interest of the teachers as positively demonstrated by the teeming numbers that turned up for the seminar. He, however, implored the teachers to take an advantage of the unique opportunity that these series of intensive seminars would afford them and contribute their quotas in equipping the children under their charge to suit the new challenges of the space age. He also paid a glowing tribute to the untiring efforts of Dr. (Mrs.) Grace A. Williams, the Director of the course who, he said, has always been the moving spirit behind the survival of the new mathematical concepts in our Lagos Primary Schools. In conclusion, he also expressed his appreciation of the financial assistance rendered by the Education Development Center (EDC) in the United States of America, in making the course feasible.

Classification and Staffing

On the first day, there were about 265 teachers in attendance. A few more joined during the first week. The "freshers" were grouped into three classes. Those with one or two years teaching experience in modern mathematics were grouped into one class.

Messrs. S. O. Adebomi, C. A. Williams, D. O. Odugbose, E. A. Ogunye, E. E. David and Mrs. C. M. Adegoke were in charge of the classes. Dr. (Mrs.) G. A. Williams combined both regular teaching one of the groups with directing the course. Mr. G. A. Borisade handled the general administration of the course. Mr. S. Sidney, of the Yale Five-year B.A. Program, who resumed with us on the 1st of September 1969, contributed his own quotas to the general success of the seminar. Mr. D. A. Fakoya of the Lagos State Ministry of Education and Community Development was in attendance for the greater part of the course. Mr. S. B. Odutayo, the Headmaster of St. Patrick's R.C.M. School, played host. He was always around to render a helping hand at call. We commend very highly his generosity and tolerance.

Attendance

The attendance of the participants was very encouraging. Each strove to turn up punctually and regularly. They all composed themselves in a learning situation and participated enthusiastically in the discussions.

Group, as well as general photographs, were taken towards the close of the seminar to mark the memorable occasion.

Closing

There was an assembly of all the participating teachers and instructors at 12:45 p.m. on Friday, September 5, 1969. Several questions relating to general administrative problems touching on the teaching of modern mathematics in Primary Schools, the attitude of some headteachers, difficulties arising from transfer and non-replacement of modern mathematics teachers, and the scarcity of Entebbe Mathematics textbooks were raised. These were aptly thrashed by the Director. Some teachers requested award of certificates as a token of their having attended series of Entebbe Mathematics Courses. The Director assured the teachers of a brighter programme than mere award of honorary paper certificates for the conscientious and diligent individuals. This, she concluded, would entirely depend on merit.

It was suggested, unanimously accepted, and noted for future action, that all visual aids produced during such seminars should be displayed towards the end of the course for general viewing.

As a mark of their appreciation of the valuable knowledge and experience in the field of modern mathematics acquired during the two-week intensive seminar, the participating teachers made a number of presentations to their instructors, the Director, and the co-ordinator. This marked the climax of the occasion.

Mr. D. O. Odugbose, a veteran schoolmaster, moved a vote of thanks to bring the seminar to a close.

G. A. Borisade
Assistant Education Officer
Lagos City Council
Department of Education

Use of Entebbe Texts

	Number of Primary Classes	Number of Secondary Classes	Number of T/Training Classes
Ethiopia	25	300	4
Ghana	116	37	20
Kenya	211		2
Liberia	35	18	3
Malawi	36	6	10
Nigeria	130 approx.	200 approx.	105
Sierra Leone	16	6	6
Tanzania	115	60	10
Uganda	28		60
Zambia	65	3	40 approx.
	<hr/>	<hr/>	<hr/>
Total	777	630	260

The 1968 figures are not available. Most countries failed to complete the proforma. We suspect that this is due to the fact that the figures are not now easily obtained because of much wider use of the Entebbe materials - or the introduction of local adaptations which are taking over in classes formerly using the Entebbe series.

Based on information available November 7, 1967.

Note: Now estimated at a total of 2,000 classes.

List of the Entebbe Mathematics Series

ENTEBBE MATHEMATICS SERIES

Primary One

Revised Preliminary Edition
Pupil Book: One volume
Teachers' Guide: Two volumes

Primary Two

Preliminary Edition
Pupil Book: Two volumes
Teachers' Guide: Two volumes

Primary Three

Preliminary Edition
Pupil Book: Two volumes
Teachers' Guide: Two volumes

Primary Four

Preliminary Edition
Pupil Book: One volume
Teachers' Guide: One volume

Primary Five

Preliminary Edition
Pupil Book: One volume
Teachers' Guide: One volume

Primary Six

Preliminary Edition
Pupil Book: One volume
Teachers' Guide: One volume

*Entebbe Primary Series Guide, Preliminary Edition

Entebbe Mathematics Teachers' Handbook, Primary I-III, Preliminary Edition, superseded by

Handbook for Primary Teachers, Preliminary Edition

FIVE YEAR COURSE

Secondary One

Preliminary Edition
Student Text: One volume
Teachers' Guide: Three volumes

Secondary Two

Preliminary Edition
Student Text: Three volumes
Teachers' Guide: Three volumes

Secondary Three

Preliminary Edition
Student Text: Algebra—One volume
 Geometry—One volume
Teachers' Guide: Algebra—One volume
 Geometry—One volume

Secondary Four

Preliminary Edition
Student Text: Algebra—One volume
 Geometry—One volume
Teachers' Guide: Algebra—One volume
 Geometry—One volume

Secondary Five

Preliminary Edition
Student Text: One volume
Teachers' Guide: One volume

Additional Mathematics (O level), Preliminary Edition: *Student Text*, 2 vols.; *Teachers' Guide*, 2 vols.

Advanced Mathematics (A level), Preliminary Edition: *Student Text*, 2 vols.; *Teachers' Guide*, 2 vols.

Basic Concepts of Mathematics, an Introductory Text for Teachers

- Volume I —Revised Preliminary Edition—*Structure of Arithmetic*
- Volume II —Revised Preliminary Edition—*Structure of Arithmetic*
- Volume III—Preliminary Edition—*Foundations of Geometry*
- Volume IV—Preliminary Edition—*Measurement, Functions, and Probability*

Syllabus Sourcebook for Teacher Training Colleges (under preparation)

* at publishers

FOUR YEAR COURSE

Secondary C One

Preliminary Edition
Student Text: Algebra—One volume
 Geometry—One volume
Teachers' Guide: Algebra—One volume
 Geometry—One volume

Secondary C Two

Preliminary Edition
Student Text: Algebra—One volume
 Geometry—One volume
Teachers' Guide: Algebra—One volume
 Geometry—One volume

Secondary C Three

Preliminary Edition
Student Text: Algebra—One volume
 Geometry—One volume
Teachers' Guide: Algebra—One volume
 Geometry—One volume

Secondary C Four

Preliminary Edition
Student Text: One volume
Teachers' Guide: One volume

Entebbe Texts Production

Texts produced at 7 Math Workshops

Primary		20
Secondary		
5 year Program	20	
4 year "C" Program	14	
+ 4 Additional Mathematics	4	
+ 4 Advanced Mathematics	4	42
Teacher Training		<u>4</u>
	TOTAL	66

Publications and Distribution Costs (estimated)

Recording & Statistical	\$ 102,167.87
Silver-Burdett	114,250.84
SRA	215,802.62
SRA final charges	<u>76,000.00</u>
TOTAL COSTS	508,221.33

Texts to be Published

Date Available

4 Volumes: two each, Advanced Mathematics, Student Text and Teachers' Guide, Volume 1 and Volume 2

Volume 1 - Student	December 1969
Volume 1 - Teachers'	December 1969
Volume 2 - Student	June 1970
Volume 2 - Teachers'	June 1970

1 Volume: Mathematics Syllabus Sourcebook (ABC Institute) March 1970

1 Volume: Entebbe Primary Series Guide March 1970

Total Number of Entebbe Texts Distributed

A) Ethiopia	17,549	
Ghana	38,608	
Kenya	45,328	
Liberia	32,683	
Malawi	21,897	
Nigeria	127,792	
Sierra Leone	31,790	
Tanzania	59,112	
Uganda	23,323	
Zambia	<u>31,537</u>	

429,619

B) Total Number Inspection copies sent outside Africa	55,258
C) Peace Corps Inspection Sets (60) 1968	<u>2,802</u>

Total Number Texts Distributed 487,679

D) Available at EDC		
Uganda	} Disposal Inventory Storage	5,016
Kenya		6,283
File copies - disposal		7,000
Office copies on hand (approx.)		1,000
Alpine Press, Inc. inventory (approx.)		<u>8,000</u>
		<u>27,299</u>

Grand Total 514,978

Workshop Participants

1962	64
1963	80
1964	58
1965	50
1966	47
1967	35
1968	<u>38</u>
	372

A total of 372 attended the 7 Workshops consisting of 186 individuals as follows:

African	102
U.S.	75
British	7
Others	<u>2</u>
	186

Six participants attended a three-week meeting of the Testing Working Group during June/July, 1969 at Mombasa, Kenya.

Large Scale Additional Publications
of
Adapted Entebbe Texts Undertaken by African Countries

<u>Country</u>	<u>Printed in</u>	<u>Level</u>	<u>No. Copies</u>
† Ethiopia	English	Grades Seven - Twelve	239,000
	* Amharic	Primary One & Two	350,000
Ghana	English	Primary One	**
		Primary One, Two, Three	**
Nigeria	English	Primary One	5,000
	English	Secondary C One	**
Tanzania	Swahili	Primary One & Two	<u>400,000</u>
Total			994,000

This total of 994,000 books published does not include the primary texts printed in Kenya and Ghana or the secondary texts printed in Nigeria.

- * under preparation
- ** unknown

Non-African Publications

Associated Publishers, PTE, Ltd., of Hong Kong are planning to undertake a printing of the Secondary C Entebbe texts (quantity unknown) for use in Malaysia, Hong Kong and Singapore.

Additional Non-African Interest

Franklin Book Programs, Inc., are about to undertake a review of the Entebbe Mathematics Series for possible translation and use in many countries overseas. In particular, a translation and printing for Iran is under immediate consideration.

† See next page for details

PRODUCTION OF ADAPTED ENTEBBE TEXTS

IN ETHIOPIA

to November 1969 *

<u>Level</u>	<u>Printed</u>	<u>Copies</u>
Grade Seven, Junior Secondary One	1968	30,000
Grade Seven, Junior Secondary One	1969	40,000
Grade Eight, Junior Secondary One	1969	30,000
Grade Nine, Senior Secondary One, Algebra C One ...	1967	15,500
Algebra C One ...	1969	15,500
Geometry C One ..	1967	15,500
Geometry C One ..	1969	15,500
Grade Ten, Senior Secondary Two, Algebra C Two	1968	12,000
Algebra C Two	1969	12,000
Geometry C Two ...	1968	12,000
Geometry C Two ...	1969	12,000
Grade Eleven, Senior Secondary Three, Algebra C Three	1969	8,000
Geometry C Three	1969	8,000
Grade Twelve, Senior Secondary Four, Mathematics C Four.	1969	5,000
Teachers' Handbook: Grade Seven	1968	4,000
Grade Eight	1969	<u>4,000</u>
	<u>Total</u>	239,000

*From report of Mr. John Overton, UNESCO Book Production Expert
November 22, 1969

Interest in Entebbe Texts
Outside Africa

USAID Mission to Nepal
Kathmandu, Nepal

State Institute of Science
Education
Rajasthan Udaipur, India

Ministry of Education
Singapore

University of Poona
Poona, India

College of Arts, Science
and Technology
Bambili, P. O. Esrendu
West Cameroon, Africa

Teacher Training College
Leifilifi, Apia
Western Samoa

Guanabanas School
Aguada, Puerto Rico

Professor Blakers
University of the West Indies
St. Augustine, Trinidad
West Indies

Universidad De Chile
Antofagasta, Chile

The University of Western Ontario
London, Canada

Director of Education
Education Department
Rarotonga, Cook Islands
New Zealand

Department of Education
Wellington, Cook Islands
New Zealand

Mr. Tiberiu Roman
Bucuresti, Romania

District School
Emek Bet Shean, Israel

Kibbutz Lavee
Lower Galilee, Israel

UNRWA - Masithel Quarter
Beirut, Lebanon

The University of Guyana
Georgetown, Guyana
South America

Companhia Siderurgica
Sao Paulo, Brazil

Ministry of Education
Kingston, Jamaica

Strong Interest

Dr. Jose Vicente Alvarez
Editorial Norma
Cali, Colombia

Director of Education
Education Department
Sabah, Malaysia

Ministry of Health, Education and Labor
Department of Education
Gaborone, Botswana

Regional Headquarters
Education Department
UNESCO/UNICEF
Teacher Training Project
Hargeisa, Somali Republic

Hlotse Sese Ferry School
Leribe, Lesotho

Teacher Training College
Serowe, Botswana

Teacher Training College
Francistown, Botswana

The University of Botswana, Lesotho
and Swaziland
Department of Mathematics
Roma, Lesotho

Teacher Training College
Lobatsi, Botswana

St. Catherine's Training College
Maseru, Lesotho

Seepapitso Secondary School
Kanye, Botswana

Mr. K. E. Barter
Adelaide, Australia

Mr. E. L. Thomas
Shelf, Near Halifax
Yorkshire, England

The Moraitis School
Psychikon
Athens, Greece

Education Extension Center
Wahdat Colony
Lahore, Pakistan

Department of Mathematics
University of Chile
Antofagasta, Chile

Professor Angel Hernair
Consejo Nacional de Investigaciones
Cientificas Y Tecnicas
Buenos Aires, Argentina

Mr. Fred Elmon
Office of the Educational Administrator
Saipan, Mariana Islands

Mrs. Lynne Kada
Office of the High Commissioner
Saipan, Mariana Islands

Requested Inspection Sets

University of Malaya
Kuala Lumpur, Malaysia

Mr. Suresh Kumar Iyer
H. No. 235 Panchajanya
Parash Ram - Shalimar
Shalimar - Delhi, India

Z. P. High School
Guntur District, India

Ministry of Education
Maseru, Lesotho

Mr. Jean Bouhart
Rijksoverheidschool
Tongeren, Belgium

Mr. C. V. Papa
Inner London Education Authority
Uganda

Dr. Julia B. Caparros Morata
Director
C.I.M.P.
Canary Islands, Spain

Brian Monkton
Chislehurst, Kent, England

Institute of Education
Lahore, West Pakistan

Department of Education
University of the West Indies
Jamaica, West Indies

Mr. John Heng
Chairman
Associated Publishers PTE, Ltd.
Singapore, Malaya

Ali Asghar Mohajer
Director
Franklin Book Programs, Inc.
Tehran, Iran

Mr. Riad Abaza
Franklin Book Programs, Inc.
P.O. Box 21
Cairo, United Arab Republic

Department of Education
Mbabane, Swaziland

Mr. Regis Parent
Canadian Technical Advisor
St-Louis, Senegal

University of Natal
Pietermaritzburg, Natal

Ministere de L'Education Nationale
Kinshasa, Congo

University Institute of Education
Oxford, England

Institute of Education Library
Hull, Yorkshire, England

Father C. van Uden
Hatten, Holland

The Association of Teachers of
Mathematics
Urmston, Lancashire, England

Mr. Marcel Desandryl
European School
Brussels, Belgium

Queen's University
Kingston, Ontario, Canada

University of the Philippines
Diliman Quezon City
Philippines

Mr. Hamid Ali Khan
Muassaso-e-Matbuat-e-Franklin
P.O. Box 369
Lahore, West Pakistan

Mr. Muriel Alam
Franklin Book Programs, Inc.
P.O. Box 63
Dacca, East Pakistan

Mr. Hassan Shadily
Jajasan Dana Buku Indonesia
P.O. Box 2397
Djakorta, Indonesia

Dr. Mohammed Najm
Franklin Book Programs, Inc.
BP 4092
Beirut, Lebanon

ABC Institute Program(i) Participation by Year

	<u>1966</u>	<u>1967</u>	<u>1968</u>
A	33	36	32
B	7	12	12
C	9	6	7
D	-	17	-
	49	71	51

(ii) Participation by Country and Year

	<u>1966</u>	<u>1967</u>	<u>1968</u>
Ethiopia	2	7	4
Ghana	6	6	3
Kenya	2	1	1
Liberia	4	4	2
Malawi	5	6	5
Nigeria	17	24	9
Sierra Leone	5	7	4
Tanzania	5	7	9
Uganda	2	3	1
Zambia	-	5	13
Swaziland	-	-	-
Botswana	-	1	-
Lesotho	1	-	-

(iii) Correspondence Course Involvement

1966/67	Over 60 %
1967/68	Over 40 %

(iv) Staff Members by Year and Continent of Origin

(including C participants and other volunteer staff: TEEA; PCV; Yale)

	<u>1966</u>	<u>1967</u>	<u>1968</u>
Africa	9	6	6
America	3	10	4
Asia	1	-	-
Europe	-	1	1

(v) Films Produced and Distributed

1. Assigning Fractions to Points on a Number Line
2. Folding and Turning Symmetries
3. New Mathematics in the Primary School

44 copies of these films sent to Teacher Training College tutors

(vi) Tapes

Completed Scripts

<u>Title</u>	<u>Author</u>
* 1. Basic Concepts of Mathematics	Paul Johnson
* 2. Why Change Our Mathematics?	Peter Hilton
* 3. Motion Geometry	R. J. Troyer
* 4. What Geometry?	R. J. Troyer
* 5. Estimation	Vincent Haag
* 6. Functions	Christopher Modu
* 7. Should Geometry Be Taught in the Primary Schools?	W. Prenowitz
* 8. Mathematics and Measurement	P. D. Merrick

To be Completed

Author

9. Order	S. Hill
10. The Co-Ordinate Plane	S. Hill
11. The Number Line	C. Hardgrove
12. Curriculum of the Future: Discussion on the Syllabus	C. Hardgrove
13. The Distributive Property	B. J. Pettis
14. Development of Numbers	H. Rogers, Jr.
15. Properties	D. Ostberg
16. Gathering and Sorting Data	R. Dilworth

(vii) Mathematics Syllabus Sourcebook
(Suggestions for Teacher Education in Mathematics)

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Standard Six Level
2. Mathematics Syllabus for a Four-Year Teacher Training College
3. Mathematics Syllabus for a Two-Year Teacher Training College:
School Certificate Level
4. Topics Usually Included in Most Primary Mathematics Programs

Section B - INSTITUTES

5. Discussion
6. Planning an Institute
7. Two-Week In-Service Institute Program

Section C - ADDITIONAL SUGGESTIONS

8. Audio-Visual Aids
9. A Selection of Mathematical Topics

PROGRESS REPORT

A B C I N S T I T U T E P R O G R A M

October 17, 1969

African Mathematics Program
Hugh P. Bradley, Director

Ford Foundation, Grant 66-101

Education Development Center
55 Chapel Street
Newton, Massachusetts 02160

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Progress Report

I. Introduction

The ABC Institute Program has held three summer sessions at the University College, Nairobi, Kenya. The Institute begun in 1966 concerned itself with the mathematical education of the senior mathematics tutors of the ten participating countries. As a result of these activities each country now has a small cadre of people, knowledgeable about modern mathematics, capable of assisting in the adaptations of the materials to suit local conditions and in the mathematical re-education of their fellow tutors in smaller colleges, who, in turn, will give suitable training to the teachers in the schools or about to enter the schools. One hundred participants attended the three summer sessions; of these, nearly forty attended all three sessions. (A full account of these activities will be found in the 1966, 1967 and 1968 Progress Report of the ABC Institute, submitted to the Foundation.)

The present and concluding activity of the Program is the preparation of teacher training films, tapes and a sourcebook to assist the ABC participants with their work in the teacher training colleges.

With the realization that the outstanding work - completion of the audio-tapes and the sourcebook - could not be completed within the time period stated in the Terms of the Grant, an extension of the grant period until December 21, 1969, was kindly approved by the Foundation. (see November 22, 1968 letter by David R. Smock, Program Officer)

II. The Pilot Teacher Education Films

The original purpose of this pilot effort was to investigate the possibility of cooperating with an African film company in the production of films for teacher training purposes. Extensive footage was shot in Ghanaian classrooms with the cooperation of the EDC Film Studio and the Ghana Film Industry Corporation. The quality of the footage was sufficiently good to permit the production of three films:

<u>Title</u>	<u>Date Completed</u>
Assigning Fractions to a Number Line	Oct. 4, 1968
Folding and Turning Symmetries	Oct. 14, 1968
New Mathematics in the Primary School	June 23, 1969

The purpose of the films was to demonstrate how some African primary school teachers with little special mathematical instruction are handling the new mathematics materials. The object was not only to provide teacher training films but to use the existing African facilities and technicians with the hope that the experience gained would enable the Africans to produce, independently, their own training films in the near future.

The first two films were shown at the 1968 closing session of the Program and have been reproduced in quantity. Copies have been sent to all the participants who attended this session, together with Film Evaluation Report Forms. To date 1,132 forms have been returned. In general, these evaluations have been most favorable.

Most of the students in the African teacher training colleges have had no previous contact with new mathematics. The third film, New Mathematics in the Primary School is intended to give these students - at the beginning of their training course - a flavour of the changes taking place in the teaching of primary school mathematics.

Audio-Tapes

An audio-tape on Basic Concepts of Mathematics was used at the 1968 session of the ABC Institute. This tape was very well received by the participants who stated that many more tapes should be made available. As a result of this favorable response a series of 16 tapes on diverse mathematical subjects has been under preparation. These tapes will be used by the mathematics tutors in teacher training colleges to supplement materials already available in written form and to indicate the relevance of mathematics to real-world situations.

The first eight tapes have been completed as follows:

<u>Title</u>	<u>Script Author</u>	<u>Voice</u>
1. Basic Concepts of Mathematics	Prof. Paul Johnson U.C.L.A.	Dr. Christopher Modu Deputy Registrar West African Examinations Council Accra, Ghana
2. Why Change Our Mathematics?	Prof. Peter Hilton Cornell University	Mr. A.M. Fagbulu Assistant Chief Inspector of Schools Ministry of Education Ibadan, Western State Nigeria
3. Motion Geometry	Prof. R. J. Troyer Lake Forest College Illinois	Dr. Daniel Chaytor Department of Zoology Njala University College Freetown, Sierra Leone
4. What Geometry?	Prof. R. J. Troyer	Dr. Christopher Modu
5. Estimation	Prof. Vincent Haag Franklin and Marshall College Lancaster, Pennsylvania	Mr. Onesmo Moiyo Tanzania
6. Functions	Prof. Vincent Haag	Dr. Christopher Modu

- | | | |
|--|---|---|
| 7. Should Geometry Be Taught in the Primary Schools? | Prof. W. Prenowitz
Brooklyn College | Mr. J. A. O. Sofolahan
Acting Chief Education Officer
Ministry of Education
Ibadan |
| 8. Mathematics and Measurement | Prof. P. D. Merrick
Educational Science Consultants
San Leandro, California | Dr. Daniel Chaytor |

The eight tapes to be completed are:

- | | | |
|--|--|--|
| 9. Order | Prof. S. Hill
School of Education
University of Missouri | |
| 10. The Co-Ordinate Plane | Prof. S. Hill | |
| 11. The Number Line | Prof. C. Hardgrove
Department of Mathematics
Northern Illinois University | |
| 12. Curriculum of the Future: Discussion on the Syllabus | Prof. C. Hardgrove | |
| 13. The Distributive Property | Dr. B. J. Pettis
Department of Mathematics
University of North Carolina | |
| 14. Development of Numbers | Prof. L. Rogers, Jr.
Mathematics Department
MIT
Cambridge, Massachusetts | |
| 15. Properties | Prof. D. Ostberg
Department of Mathematics
Northern Illinois University | |
| 16. Gathering and Sorting Data | Prof. R. Dilworth
Department of Mathematics
California Institute of Technology | |

Although it was intended that all the tapes would be completed in 1969, this does not seem likely. The heavy academic schedule of the script authors and other related activities, together with campus disorders throughout the United States, have brought about an unavoidable delay.

The tapes, together with Audio-Tape Evaluation Forms will be sent to the ABC Institute participants.

IV. Sourcebook

Preliminary material for a sourcebook, an aid for training college tutors, was prepared by the ABC Institute participants at the writing groups and seminars of the 1967 and 1968 sessions. The material was designed to help the participants in running pre-service and in-service courses. This preliminary material has been reviewed by consultants in the United States with a view to presenting it in printed form. The review has made necessary considerable reorganization and selection of the material and some rewriting. The sourcebook, when available, will include:

1. Discussion on teacher education
2. Suggestions for a pre-service syllabus
3. Suggestions on how to organize an in-service institute
4. Topics for a teachers' institute - Primary
5. Topics for a teachers' institute - Secondary
6. Topics for special lectures
7. Suggestions for films and tapes

This additional guide will be used along with the printed material of the Entebbe Mathematics Series, The Basic Concepts of Mathematics and The Handbook for Primary Teachers. It will advise the tutor on the variety of material available for his teaching, the topics which should be dealt with and it will suggest good ways of dealing with these topics.

V. The Future

The work of the ABC Institute will come to an end when the sourcebook and audio-tapes have been completed and distributed. It now seems certain that completion in 1969, as planned, will not be possible. Pressure of work on consultants and in some cases cessation from extra campus duties because of campus troubles have caused regrettable delays. It now appears that distribution of material and collection and assessment of feedback will require another six months.

African Mathematics Program
Executive Meeting: London - April 1969

Summary of Proceedings

Attending: Professor W. T. Martin (Chairman), Massachusetts Institute of Technology
Mr. J. L. Aldrich, Acting Vice President, Education Development Center
Mr. H. P. Bradley, Director, African Mathematics Program
Professor R. Dilworth, California Institute of Technology
Mr. C. Modu, Deputy Registrar, West African Examination Council
Professor W. Prenowitz, Brooklyn College, University of New York
Dr. A. Williams, Fourah Bay College, University of Sierra Leone

Dr. Abbiw-Jackson, College of Science and Technology, Kumasi, Ghana, was injured in a plane crash while traveling to the meeting and was unable to attend. (Added June 17, 1969. We are pleased to report that Dr. Abbiw-Jackson has recovered with no permanent injury.)

1. The meeting began with a Review of the Activities of the African Mathematics Program to date. This review included the following topics:
 - (a) Classes using the materials
 - (b) Textbooks published or about to be published, including most up-to-date information about costs of Publication and Distribution
 - (c) Breakdown of Workshop participation
 - (d) Teacher Training Institutes, including latest information about plans for the remainder of 1969
 - (e) Testing including present status of testing program
 - (f) ABC Institute
 - (i) Breakdown of participation
 - (ii) Correspondence Course involvement
 - (iii) Number of staff involvement
 - (iv) Films produced
 - (v) Audio tapes planned
 - (vi) Sourcebook

The relevant information is attached to this summary as an Appendix.

In the discussion arising from the review of the program, it was pointed out (a) that the figures on "Classes Using the Materials" did not give the complete picture as some countries had not given returns for 1968, and it was known that many classes had been started without our knowledge. It was known that the Swahili version was being introduced into all Standard 1 classes in Tanzania, that Ghana had produced its own adaptation of the Entebbe texts and was introducing this adaptation into Standard 1 classes and that the private production of new texts in Nigeria, Uganda and Zambia had made the situation very confused.

Ethiopia is producing an Amharic translation of Entebbe Primary One text for introduction into Ethiopian schools in 1970.

- (b) It is the opinion of the Executive Committee that the reform of mathematical education at primary, secondary and teacher education level is being seriously retarded because a continuing supply of the texts - at primary, secondary and teacher education level - is not available.

The program has now dispatched its full inventory of texts to the African countries, keeping only a small supply for disposal for inspection purposes.

- (c) It was pointed out that the testing materials produced have been of three main types.
- (i) Achievement Tests which measure the extent to which students learn the mathematics of the textbooks
 - (ii) Model Tests intended to assist Ministries, Examination Boards and schoolmasters to develop suitable tests for their own purpose
 - (iii) Comparison Tests which make possible a comparison between the mathematical education offered by the Entebbe Texts and that offered by traditional or other text books. Such tests were offered as an aid to Ministries or schoolmasters who were concerned by the difference in mathematical content of the Entebbe texts.

Concern was expressed about the ability of the African Ministries and the African schools to cover the costs of replicating the achievement tests in the format in which they are presently available. It was agreed that this format should be examined with a view to producing a model which would be less expensive to copy.

2. Present Activities

- (a) Testing. Six people are being invited to participate in a three-week Testing Working Group at Mombasa this summer. The group will undertake the following tasks:
- (i) Preparation of tests for Teacher Education and Advanced Mathematics
 - (ii) Preparation of the final form of tests previously pretested.

The composition of the Testing Group was discussed. Professor R. Dilworth will be Chairman of the group.

The West African Examination Council has been asked to assist in the processing of data obtained from the Primary tests given in Ghana and Malawi. The Council should be informed that payment will be made for the work undertaken. It was agreed that under the present conditions that the services of the psychologist need not be continued beyond June 1969.

- (b) Films. The committee was given details of discussions which have been held with the Ghana State Film Industry Corporation (SFIC). The SFIC is developing a proposal for presentation to the West African Ford Foundation representative for the production of ten films on mathematics for use in African Teacher Training Colleges. The Corporation is requesting the assistance of the Program in the mathematical educational aspects of the work and in distributing the films and in making available consultant help for classroom filming techniques from the EDC film studio. Most of these films will be taken in Ghana but some work will also be done in East Africa and Nigeria.

It is intended that the films demonstrate good teaching and good

mathematics, methods of attacking lessons which teachers find difficult, and the development of mathematical thinking through the primary school in two or three selected topics - such as the Number Line.

The SFIC has already produced its first draft of the proposal and hopes to present it to the Ford Foundation within the next two months. It is not known how the Foundation will receive this proposal.

- (c) Tapes. A small ad hoc sub-committee of the steering committee, consisting of Professors V. Haag, D. Richmond, W. T. Martin and Mr. H. P. Bradley, had identified topics which could usefully be put on audio tape and had prepared a list of those who appeared to be most suitable to prepare the scripts. In some cases the script writer himself would do the recording; in other cases Africans in the Boston area will record for the script writer. It was agreed to proceed with the preparation of the audio tapes for use with the teacher training materials developed by the program. It was felt that these tapes could be a useful source of strength and encouragement to the African teacher training college tutors.

Two additional tapes were proposed:

- (i) Congruence
- (ii) Mathematics as a Living Subject

- (d) Sourcebook. The sourcebook outline (see appendix) was discussed. This book is intended to be a further aid to the Teacher Training College tutor in Mathematics, identifying for him some useful objectives for his course, suggesting ways to achieve these objectives, helping him with ideas for his teaching approach, suggesting suitable courses for different types of intake, giving advice on in-service courses and how to use audio-visual aids in pre-service and in-service work.

It was felt that the outline was too "bare" to permit detailed comment but some concern was expressed on the separation of items such as "Mathematical", "Pedagogical", "Psychological" purposes. In a course such items are so intertwined that to deal with them separately might lead to wrong teaching approaches. It was agreed, however, that a tutor in mathematics in a teacher training course should recognize his objectives in these matters. It was hoped that in the presentation in the Sourcebook it will be possible to indicate how the work proposed will achieve the objectives.

- (e) Publications. The timetable for availability of texts still to be published is in the appendix.
- (f) Evaluation. The USAID have completed the evaluation of the Program in the manner described at the 1968 Mombasa meeting of the Steering Committee.
- (i) Professor Gail Young and Dr. Henry Pollak travelled in East and West Africa in November and December 1969, speaking to Ministry officials, teachers and program participants, in Ethiopia, Ghana, Kenya, Nigeria, Tanzania and Uganda.

- (ii) Professor Begle of the SMSG, with the cooperation of Professor Dilworth and the Tanzanian and Ghanaian Ministries of Education, had applied tests to measure the achievement of pupils who had used the Entebbe texts.
- (iii) At the request of the Evaluation Group
Some of the texts had been sent for evaluation, as follows:
Dr. Matts Hastad, Sweden, Primary Four & Handbook for Primary Teachers
Prof. Eric Kristensen, Denmark, Secondary C One, C Two, C Three, C Four
Prof. Bent Christiansen, Denmark, Primary Four & Handbook for Primary Teachers
Prof. Lucas M. H. Bunt, Arizona State University. Secondary Four and Secondary Five and Additional and Advanced Mathematics (for Probability only)
Prof. Craven Bjork, University of California. Secondary C One, C Two, C Three and C Four

Before bringing this part of the agenda to a conclusion the Chairman informed the meeting that a small group of former workshop participants are about to undertake the publication of a mathematics text based on Additional Mathematics, but with noticeable differences, to make the text suitable for use in the United States. The proceeds from the sale of this text will be controlled by a small committee and used to further mathematics education in Africa. It is thought that something similar may be done with the Advanced Mathematics text in due course.

There are also some plans for the preparation of a USA version of the Teachers' Handbook by some of the Primary Writing Group with a similar intention of setting up a fund to help African students, but the full details are not known.

3. Future Prospects

Conversations with USAID/Washington have indicated that there is little hope of African countries obtaining direct bilateral help for mathematical education from local USAID missions.

There is some hope, however, of some regional help being given. In a plan currently being considered there is the probability of appointments being made - one in East/Central Africa and one in West Africa - to make possible a continuation of the efforts of the program. Nobody thinks that this number is sufficient, but in this period of financial stringency it is the maximum possible. The tasks to be undertaken by these appointees would be:-

- (a) To maintain contact with countries anxious to improve their mathematical education and try to maintain (or recover) the impetus generated by the program in our seven years (to 1968) of activity.
- (b) To encourage the Ministries to undertake teacher training institutes (in-service) and help them to introduce improved courses in teacher training colleges (pre-service).
- (c) To identify people in the countries involved who can take part in a participant training program (rather a continuation of our ABC program).

- (d) To assess the book needs and help required to satisfy the book needs of the countries involved and to investigate the possibility of the necessary Entebbe texts being published under a multi-donor effort through the Unesco publishing program at Yaoundé in the Cameroons.
- (e) To try to make possible a transfer of responsibility for mathematical education to the new East African Education Council and the similar council being considered for West Africa. The plan being considered would make possible the application of multi-donor funds directly to African institutions which most people consider a better procedure than that presently operating. It is anticipated that in the proposed plan the Councils would operate through steering committees consisting of mathematicians, teachers of mathematics and mathematical educators rather similar to our present organization with a much heavier African base but not excluding the use of foreign consultants.

If this plan is finally approved these appointees would probably operate under the African Mathematics Program although under USAID rules other organizations will be given the opportunity of offering their services for this task.

The Executive Committee, while commenting that the placement of two men in Africa would certainly not be enough to satisfy all the requests for assistance, felt that in the present financially difficult times the plan was the best that could be expected. It was decided to inform USAID/Washington that the Program would like to be considered as a contractor to implement the plan.

Regional Meetings. Following discussions in Washington and with USAID approval, letters were sent to African Ministries of Education to enquire if they were interested in participating in regional meetings to discuss common problems in the improvement of mathematical education in their countries. A tentative agenda suggested for these meetings was:-

- (a) Consideration of common needs for mathematical books which cannot easily be published nationally (e.g., Teacher Education texts, Secondary texts) and ways of satisfying these needs.
- (b) Consideration of the requirements for in-service and pre-service teacher education in mathematics.
 - (i) possibility of common use of visiting personnel
 - (ii) possibility of collaboration in a mathematics leadership training program
- (c) Other items which the countries involved feel worthy of consideration

Four regions are being considered:

Sierra Leone, Liberia and Ghana
All the Nigerian states
Ethiopia, Uganda, Kenya, Tanzania
Malawi, Zambia, Lesotho, Botswana and Swaziland

To date favorable replies have been received from Botswana, Ethiopia, Ghana, Kenya, Lesotho, Liberia, Malawi, Swaziland from Benue Plateau State, Kano State and Western State in Nigeria. The reply from Zambia supported the idea of the

meeting but raised other problems.

African Coordinating Committee. The African Social Studies Program which is being developed consequent on the meeting held in Mombasa in August 1968 has had two meetings since that time. The prospects for successful work are promising. One of the schemes being considered by the social studies program is the setting up of a Coordinating Committee which will make possible cooperation between countries and make easier dissemination of ideas and materials developed nationally.

USAID/Washington has expressed interest in the proposed Coordinating Committee and has suggested that the method could usefully be applied to the African Mathematics Program and the African Primary Science Program. No firm proposals were made but **it is thought that** Social Studies Coordinating Committee might be expanded at a later date to have Science and Mathematics sections. One of the main attractions for USAID is that proposed committee would be African based and directly under the control of African educators.

The Executive Committee considered the implications of this suggestion and finally agreed that with proper and adequate representation of African mathematicians the "Clearing House" could well serve the cause of mathematical education in Africa. The following resolution was agreed: "The African Mathematics Program looks forward to cooperating with the African Primary Science Program and the African Social Studies Program for the setting up of an organization which will be responsible for a total African Education Program."

Outside Interest in the Program. The appendix lists requests for Entebbe materials from outside Africa. USAID has shown some interest in more widespread use of the texts, but no proposals or plans have been made. In discussions, it was made clear that the program feels that a teacher education program must be written into any plan to supply texts in number to an underdeveloped country. These discussions presupposed an additional printing of the required texts.

No plans were made for future meetings of the Steering Committee or Executive Committee of the African Mathematics Program.

SUMMARY of DISCUSSIONS
at a
REGIONAL MEETING on MATHEMATICS
(Ghana, Liberia and Sierra Leone)

Place of Meeting: Accra, Ghana
Date of Meeting: August 13, 1969

People Present

- Dr. D. K. Abbiw-Jackson, University of Science and Technology,
Ghana
- Mr. I. N. K. Atiase, UNESCO, Deputy Chief Education Officer,
Ghana
- Mr. D. A. Brown, Principal Secretary, Ministry of Education,
Ghana
- Dr. Alwin V. Miller, Chief Education Officer, Advisor,
USAID/Liberia
- Mr. Julius Jonah, Prince of Wales School, Freetown,
Sierra Leone
- Dr. A. T. Thomas, Ministry of Education, Freetown,
Sierra Leone
- Mr. H. P. Bradley, Director, African Mathematics Program
- Prof. W. T. Martin, Chairman, African Mathematics Program

COMMON PROBLEMS

It was agreed at the Accra meeting in mid-August that discussions should be confined to common problems which could be solved through regional assistance. Two main areas were discussed:

- (a) Teacher education, including provision of material for teacher education.
- (b) The provision of textual materials at primary and secondary levels.

Teacher Education

It was recognized that the main obstacle to curriculum change was the difficulty of retraining the teachers, especially primary teachers, presently in the schools. Not only are the teachers in the schools unable to deal with the new matter and the new techniques but each year the training colleges are turning out hundreds of teachers who are still not conversant with the new mathematics and the activity methods associated with curriculum reform.

Three factors affect the in-service teacher training problem. Firstly, if the changes desired are to take place within a reasonable time rather than being spread over fifteen to twenty years, it will be necessary to run many in-service courses each year. Secondly, none of the countries has sufficient personnel to run the number of courses which will be necessary. Thirdly, the teacher training colleges are not yet geared to handle the new programs and are still graduating teachers unable to deal with the new ideas and material. The training college tutors themselves are in need of in-service type courses. They need assistance in introducing the new courses into their colleges, and they need textual and audio-visual materials to help them in this task.

Training College Tutors

Before the longer term problem of in-service courses for teachers already in the schools can be dealt with, there must be available many locations and people capable of giving such courses. The teacher education colleges, which are spread across the country appear to be the natural venues for these courses, and the college mathematics tutors are strategically placed, to give the courses. The first task of implementation is, therefore, the changing of the college mathematics curricula and the training of the mathematics tutors to deal with the new curricula. When this has been accomplished, each country will then be in a position to deal with its in-service teacher training programs internally at a rate which educational policy and finances make desirable. At Accra the in-service training of college tutors and the introduction of new college curricula based on modern mathematics were recognized as a necessary leadership training program, the first step towards implementation of mathematical curricula reform in each country. Whereas, the in-service training of classroom teachers is recognized as a task which finally must be dealt with internally, the leadership training program for tutors was felt to be one which would benefit by a regional approach.

Secondary Teachers

As much of mathematics education at secondary level is carried on by expatriate teachers, a large in-service training program at this level was not felt necessary. Rather it seemed important that, when recruiting expatriate teachers, proper experience and qualifications in new mathematics must be demanded. Despite this, it was felt that older indigenous teachers would require some help. As the numbers of such teachers is few in any one country, a small regional effort could meet the needs.

Teaching Materials

A good college text on which mathematics tutors can base their work is necessary. The Basic Concepts (4 volumes) of the Entebbe series were prepared to serve this purpose but too much material is included, the material needs adaptation to suit local purposes, the commercial volumes are too costly and books are generally unavailable. A new text, adapted from Basic Concepts, is required and should be published in Africa and made readily available at a reasonable cost.

Other College Aids

The college tutors are greatly in need of other teaching aids to assist them in teaching the new courses. The tutors in the colleges and their students have little or no experience with the new mathematical content or the teaching approaches being recommended. The tutors need teaching aids to support their teaching of the mathematics and require some visual means to demonstrate to their students good classroom procedures for dealing with the new matter in the primary school.

The pilot films already produced by the African Mathematics Program and the additional films being planned could serve well this latter need. The audio-tapes presently being made by the African Mathematics Program will help the tutors considerably as they begin to teach the new courses.

Secondary School Texts

The secondary schools in the region have now acquired some experience in teaching modern mathematics. This experience has been gained by teaching from the Entebbe secondary series and from the books of the Joint School Project. It is felt that the time has come when the results of this experimental teaching should be examined. Qualified Africans in the region

should examine the experimental texts already in use as well as other texts such as the books of the School Mathematics Project, to consider the production of a secondary series which will reflect the experience gained and satisfy better the local needs, local conditions and the educational background of local teachers. There is a sizeable cadre of Africans in the region who have assisted in writing the original Entebbe texts.

It was appreciated that the material in the Entebbe series is in the public domain and can be used and adapted freely. It is hoped that publishers of the other texts will be equally generous if it is felt that some of their material is required for the new series.

Primary School Texts

The experimental texts of the Entebbe Primary Series were produced for use in ten African countries. It was anticipated from the beginning that, independent of any revisions which the experimental teaching might make necessary, each country would wish to prepare an adaptation dealing with the local currency and measures systems and satisfying local social and geographical conditions. Thus, place names, types of word problems, etc. would need rewriting and adaptation.

There are, however, difficulties of finance and timing if each country undertakes an entirely separate publication immediately. Although adapted texts are needed to begin the work of implementation, because of the vast teacher re-education required, the introduction of the adapted texts into the schools can only be done gradually. Thus, the number of books needed immediately in any one country is small, and the unit price is increased by inverse proportion. Moreover, at this stage of development, the number of people in any one country capable of undertaking this primary school mathematics rewriting project is insufficient.

At the Accra meeting, these difficulties were recognized. It was agreed that although each country would require its own adaptation, it was most probable that the mathematical content of the local texts would be almost identical and that the real differences which dealt with currency, place names and word problems might affect only twenty per cent of the texts. It was suggested, therefore, that the countries in the region should combine to identify the expected eighty per cent common ground and to investigate the possibility of the regional publication of the common core, with separate country writing groups preparing those parts which are concerned with currency, place names, word problems and other items which are affected by geographical differences.

These tasks seemed to be within the compass of a regional team which would bring together people from the three countries and which would include several who have had experience at the writing workshops of the African Mathematics Program. It was also felt that if the book was planned so that the common core of eighty per cent could be printed on one run of the presses, the overall cost of the texts could be reduced significantly.

III. PROPOSED COURSE OF ACTION

The three main tasks identified were:

- A. The introduction of modern mathematics into training colleges through the creation of a new syllabus, the publication of a suitable textbook and the re-education of the tutors.
- B. The publication of a common primary text which would make allowances for national differences and which would be readily available at a reasonable cost.
- C. The publication of a common secondary text adapting and incorporating the existing experimental texts, and the preparation of secondary teachers of the region through in-service courses.

The availability of manpower to undertake these tasks was also considered. It was clear that within the three countries there are people with the mathematical or pedagogical strength who can contribute to the work. The number of such people increases yearly through programs planned by the Ministries. Local involvement in the African Mathematics Program, its workshops and especially through participation in its ABC Institute, have certainly helped to create a cadre of people which can be called upon to assist. Nearly all of these people, however, are already engaged in essential work from which they cannot be released or replaced. None of the countries will be able to increase sufficiently its present staff commitment to meet the proposed needs although those who are capable will be available for short periods as lecturers or seminar leaders in institutes or as participants in writing workshops.

There was general agreement that expatriate assistance will be necessary if any action is initiated along the lines suggested.

Expatriate Mathematics Educators

Two expatriate mathematicians working over a period of five years are considered necessary to supervise and carry out the work required. In view of the other mathematical needs of the area the educators selected would be mathematically competent and educationally experienced but, in addition, one should have a special interest in testing and the other a special interest in teaching aids, visual and aural. It would be expected that they will maintain close contact with the Ministries of Education and with the West African Examination Council and other organizations in the countries concerned with audio-visual work. They would work together in the three countries but would have separate areas of responsibility. Cooperating

with Ministry officials and educators they would assist each other at leadership courses for tutors which would be held in all of the three countries with mixed national participation. Jointly, they would prepare and supervise the correspondence courses which would link the continuing institutes.

Location

It was decided that the educators could be put to best use if one was located at the University of Sierra Leone (Njala Campus) and the other at University College at Cape Coast in Ghana. Although located at these universities, it was not intended that they should undertake teaching loads in the normal university schedules. Their work would be aimed directly and exclusively towards the teacher training college tutors and their colleges.

Expected Date of Appointment

If the program is funded in January 1970, it is hoped that the two educators could take up their appointments in July/August 1970.

A. Introduction of Modern Mathematics Courses into Training Colleges

It is estimated that nearly two hundred tutors, mostly Ghanaians, will require in-service courses. At the moment there are approximately one hundred colleges in the region, but Ghana is consolidating its teacher education system. On the other hand, some expansion is to be expected in Sierra Leone and Liberia.

Three main activities are proposed:

- (a) The mathematical re-education of college tutors through

a continuing series of in-service courses linked by correspondence courses, and the provision of continuing assistance to college tutors as the new courses are introduced;

- (b) The preparation of a new training college syllabus in mathematics and the publication of an adapted textbook which would be used with the new syllabus;
- (c) The provision of films and audio aids, such as tapes, for use in pre-service and in-service courses.

(a) The mathematical re-education of college tutors would be the main task of the mathematical educators. Each educator would be expected to:

- (i) Subdivide his area of responsibility so that over a period of five years, extended visits of one or two weeks duration are made to each college to assist the tutor in introducing the new courses into the college;
- (ii) On the basis of this subdivision and time schedule, visit colleges in his area and get to know the tutors, their students and the conditions under which they work;
- (iii) Organize and take part in in-service institutes for tutors from his own area and assist in institutes organized by his colleague;
- (iv) During and following the institute, working in co-operation with his colleague, maintain contact with the tutors through correspondence and correspondence courses and visit when necessary and possible;
- (v) In consultation with Ministry officials and the West African Examination Council undertake work in testing or audio-visual aids.

It is clear from the foregoing that the Ministries must be prepared to release tutors to attend the courses. However, one would expect that the courses would be held during vacations. It is also clear that the educators must maintain close contact with the Ministries, keep them informed about plans and the development of the work, and respond to their needs in so far as they are related to the terms of their appointment. Close contact must also be made with other organizations involved

in this educational area, e.g. other international programs involved in teacher education, local and expatriate audio-visual groups, the local examination section and the West African Examination Council.

(b) Preparation of a New Syllabus: Although it seems unlikely that all three countries will wish to have identical syllabuses, it is probable that in view of the structure of mathematics itself and the common needs of primary school mathematics, the syllabuses will be very similar. Thus, a common textbook should meet needs which vary only slightly.

Plan of action: A meeting of representatives of the three countries is necessary. This meeting would be organized as a writing workshop which would not only outline the syllabuses but also begin the preparation of a text to assist the tutors to introduce the new syllabuses. The workshop would undertake the following tasks:

- (i) Prepare outlines of syllabuses which would introduce modern mathematics into the colleges and improve teaching approaches.
- (ii) Examine existing teacher training texts to identify items which could be adopted or adapted to satisfy the needs of the new syllabus. In particular, it is recommended that the writing group should examine the Basic Concepts (4 volumes) of the Entebbe Series and the Wisconsin/Northern Nigeria adaptation of these texts, the Handbook for Primary Teachers (Entebbe Series) and the Tutors' Sourcebook presently under preparation for the Entebbe Series.
- (iii) Undertake such adaptation or rewriting as is found necessary after the identification of needed topics. It was thought that this task will be mainly one of selection and that not much rewriting would be required.

The two mathematics educators, working with two representatives from each country and one representative of the African Mathematics Program, should be able to complete this preliminary work in a six-weeks workshop. A full time editor could then prepare the text for publication. Such a workshop could take place in July/August 1970.

(c) Provision of Audio-visual Aids: One of the mathematical educators will have a main responsibility in this area. It is expected that he will review audio-visual aids already existing in Africa and in other countries, assess their suitability and make suggestions concerning their procurement. Experience indicates that in addition to any aids obtained from non-African sources there is a great need for visual and audio aids prepared specially for African tutors. Such aids should show African children and schools and be aimed at tutors and students and the educational background from which they have come. In other words - and especially with regard to films - aids to which they themselves can relate and which reflect both the African scene and African educational conditions.

The three films of the African Mathematics Program already produced and the tapes presently in production are the initial efforts to meet these conditions. Early reports from tutors on the use of these aids have been very good and have included strong requests for more. The heavy cost of film making is appreciated but as there is a demand from many countries, it is hoped that different regions can combine to satisfy this need. The existing films and tapes are available at reasonable cost.

Action Proposed: If mathematics programs are set up in two or more regions, a meeting should be convened to consider joint funding for the production of more films similar to those proposed by the Ghana Film Industry Corporation in association with the African Mathematics Program.

B. Preparation and Publication of a Common Primary Text.

It is proposed that the review of the Entebbe Primary Series to identify

the common mathematical core, and the preparation of the additional material necessary to satisfy different national needs, should be undertaken initially at the same workshop which prepares the teacher education text. However, as the work is considerably greater, at least three workshops will be necessary. These would take place in consecutive years.

Participants

The participants involved in this work should include:

- (i) A mathematician who is fully aware of the mathematical implication of the work being reviewed. One of the mathematicians who helped to plan and write the Entebbe Primary series would satisfy this condition most adequately.
- (ii) People with experience of primary school mathematics. Each country will be expected to send two senior people, with authority, and with this necessary experience.
- (iii) People with experience in writing primary school texts. Each country will be expected to send two people. Former participants in the African Mathematics Program's Primary Writing Group or people who have themselves produced commercial texts would be most suitable. If any country does not have two such people, former participants in the ABC Institute should be sent instead.

C. Preparation and Publication of a Common Secondary Text.

It is proposed that the review of existing secondary material and the preparation of adaptations of these materials will be undertaken at the workshops which prepare the teacher education and primary texts.

Participants

The participants involved in this work should include:

- (i) African university mathematicians with experience in the preparation of secondary school texts. Those African mathematicians who have been involved in the writing of the Entebbe Secondary Series and the materials of the Joint School Project have this necessary experience. Three such people might be adequate but if more are available they should be invited to assist.

- (ii) People with experience in secondary school mathematics. Each country will be expected to send one person with authority and with the necessary experience.
- (iii) Secondary school teachers with experience in writing secondary texts. Each country will be expected to send two such people. Former contributors to the Entebbe Secondary Series and the Joint School Project should be most suitable. If any country does not have two such people, the representatives of the other countries should be increased to bring the total to six participants with this ability.

It is expected that the manuscript for one year of school education can be completed each year but continuing pre-publication tasks be carried on subsequent to the workshops.

Publication Arrangements

An important inhibiting factor operating against curriculum reform is the heavy cost of supplying schools and teachers with new textbooks. When the changes are introduced gradually, only small printings of the new texts are necessary and the unit cost becomes very heavy. On the other hand, when, as in a structured subject like mathematics, changes must be made over large areas so that children transferring from school to school do not suffer, there are immediate heavy expenditures which the countries find difficult to meet. The countries are willing to incur some expenditures but low budgets cannot meet the extraordinary expenditures involved. Some means must be sought to make new textual materials available at an acceptable price.

The printing facility being developed by UNESCO at Yoandé in the Cameroons is well suited to solve this difficulty. This multi-national effort, involving technicians appointed and supported by an international agency, and gifts of paper and machinery, should not only keep down costs

of books, but the facility is also particularly suited to assist in the publication of texts for a multi-national program such as is being suggested for Ghana, Liberia and Sierra Leone.

The use of the Yoandé facility was discussed at the Accra meeting. It was agreed that if these presses are used and costs are reduced as expected, the countries would be able to absorb the expected additional expenditures arising from the publication and distribution of the texts prepared at the Workshops.

Continuing Research

The tutor education program and the proposed publications will not provide any final answer to mathematics in the region. There is a continuing need for research and for investigation of better methods of teaching mathematics and identifying the most suitable mathematics for the countries involved. A necessary part of any regional program in mathematics must be the development of a research facility which will evaluate existing programs and will be concerned constantly with the development of a mathematics education, which is flexible and which will respond to the changing needs of such developing countries.

The mathematics educators will be expected to interest themselves in setting up such a facility and co-operate with local personnel who are appointed to undertake this work. The mathematics educator with special interest in testing will have some responsibility in this matter. In this connection, it is anticipated that during the period of this program special funds will be needed to assist in the creation of a mathematics section for a regional curriculum research center.

Ghana, Liberia, Sierra Leone

Commitment to Implementation of Mathematical Curricula Reform

Ghana

Commitment: Mr. D.A. Brown, Permanent Secretary, and Mr. Mills, Chief Education Officer, at a meeting in 1968 stated that Ghana had already decided to introduce modern mathematics into all schools and colleges. This meeting was attended by a University representative, Ministry officials, a USAID representative and two representatives of the Program.

Involvement: The experimental program has been going for eight years. 140 primary classes and 50 secondary classes are using the experimental materials (based on 1968 information). A Ministry official has been spending full time supervising the experiments since 1966. A Ghanaian adaptation of the Entebbe Primary One text has already been published.

Personnel: Dr. Abbiw-Jackson, University of Science and Technology, Kumasi, is a member of the Executive and Steering Committee of the Program. Ten Ghanaians, including four University lecturers and one senior Ministry official, have taken part in the Workshops which prepared the experimental materials. Eight tutors and teachers attended the ABC Institute.

Institutes: One teacher training institute has been held each year since 1963 to prepare teachers to use the experimental materials. Two were held in 1968 and two in 1969.

Co-operation: The Peace Corps has been appointing volunteers to secondary schools and colleges to ensure the spread of the experiments.

Liberia

Commitment: Secretary Caine of the Department of Education at a meeting in 1968 stated that Liberia had decided to introduce modern mathematics into all classes. This meeting was attended by senior officials of the Department, a Peace Corps official, USAID representatives and those of the African Mathematics Program. Mr. J. Brian Dennis, a Liberian, was appointed to be Ministry official concerned with the reform.

Involvement: Mrs. Banks-Henries, Advisor, Textbooks and Curriculum Reform in the Department, is keenly interested in bringing about the reform. Monrovia Consolidated School District is already using modern texts in many schools. Sixty-one classes up-country are using the experimental texts.

Personnel: Four Liberians, including one from the University, have participated in Workshops that prepared the experimental texts. Six tutors attended the ABC Institute.

Institutes: One Teacher Training Institute, sometimes taking place in three or four centers simultaneously, has been held each year.

Co-operation: Cuttington College has supplied staff and a site for two Institutes. Faculty have assisted in the ABC correspondence course. Since 1965 the Peace Corps has appointed a volunteer to assist in supervising and spreading the experiments up-country. This Peace Corps Volunteer has been officially attached to the Liberian Department of Education.

Sierra Leone

Commitment: In 1968 Mr. William Conton, Chief Education officer, stated at a meeting that it is the Ministry's policy to introduce modern mathematics into all schools and all classes as soon as possible. This meeting was attended by a University representative, a Ministry official, a representative from Milton Margai College and two representatives of the African Mathematics Program.

Involvement: The experimental program has been going on for eight years. Fifty-three primary classes and seven secondary classes have been using the experimental material.

Personnel: Several years ago the Ministry appointed a National Mathematics Advisory Committee to advise the Ministry on changes in mathematics curricula. Dr. Awadagin Williams, Fourah Bay College of the University of Sierra Leone, a member of the Executive and Steering Committee of the Program, is a member of this committee. All the other members of the Committee have participated in the Program's workshops. Milton Margai College and secondary schools have provided six participants to Workshops which have prepared the Entebbe experimental texts. Eight tutors and teachers participated in the ABC Institute leadership training program.

Institutes: There have been seven Teacher Training Institutes to prepare teachers to use the experimental materials.

Co-operation: For three years a Peace Corps Volunteer was appointed to supervise and encourage the use of the Entebbe Series up-country. The University of Sierra Leone's College at Njala (supported by the University of Illinois) has been using the texts in that area.

SUMMARY of DISCUSSIONS
at a
REGIONAL MEETING on MATHEMATICS
(Ethiopia, Kenya, Tanzania, and Uganda)

Place of Meeting: Nairobi, Kenya

Date of Meeting: August 19, 1969

People Present:	Ato Gebeyehu Kumsa	Chief Expert Division of Tests and Measurements Ethiopia
	Mr. Isaac Hunja	Inspectorate Ministry of Education Kenya
	Mr. B. J. Mehta	Mathematics Department Kenyatta College Kenya
	Mr. D. S. Phull	Kenya Institute of Education
	Mr. B. D. Vogeli	Kenya Institute of Education
	Mr. R. Kiyao	Principal Co-ordinator of Mathematics Ministry of Education Tanzania
	Professor J.E. Phythian	Department of Mathematics University College Dar es Salaam Tanzania
	Mr. J. C. Dowsett	Mathematics Department National Teachers College Kampala
	Mrs. M. C. Harbottle	Senior Lecturer in Education Faculty of Education Makerere
	Dr. T. G. McDonough	Regional Education Officer EAORA/USAID
	Dr. W. A. Whitten	Department of Education Officer USAID/Tanzania
	Mr. H. P. Bradley	Director African Mathematics Program
	Professor W. T. Martin	Chairman African Mathematics Program

COMMON PROBLEMS

Discussions were confined to consideration of common problems which could be solved through regional assistance. Three main topics were discussed:

- (a) Teacher education: In-service and pre-service.
- (b) Provision of teaching materials, textual and non-textual at primary, secondary, and teacher training levels.
- (c) Training for local supervisors.

Teacher Education

In-service The main obstacle to curriculum change is the difficulty of retraining the teachers, especially the primary teachers, presently in the schools. Not only are the teachers in the schools unable to deal with the new matter and the new techniques, but each year the training colleges are turning out hundreds of teachers who are still not conversant with the new mathematics and the activity methods associated with curriculum reform.

Three factors affect the in-service teacher training problems. Firstly, if the changes desired are to take place within a reasonable time rather than being spread over fifteen to twenty years, it will be necessary to run many in-service courses each year. Secondly, none of the countries has sufficient personnel to run the number of courses which will be necessary. Thirdly, the teacher training colleges are not yet geared to handle the new programs and are still graduating teachers unable to deal with the new ideas and material. The training college tutors themselves are in need of in-service type courses.

They need assistance in introducing the new courses into their colleges, and they need textual and audio-visual materials to help them in this task.

Before the longer term problem of in-service courses for teachers already in the schools can be dealt with, there must be available many locations and people capable of giving such courses. The teacher education colleges which are spread across the country appear to be natural venues for these courses. The mathematics tutors in the colleges are thus strategically placed to give the courses. The first task of the implementation is therefore the retraining of the college tutors to enable them to deal with the new curricula.

This leadership training program for tutors was clearly one which would benefit from a regional approach.

Pre-service A necessary part of this leadership training program for tutors would be the provision of professional help in drawing up new syllabuses for the colleges and guidance and assistance in introducing these new syllabuses into the colleges. Thus two ends will be served. In the first place, the colleges will begin to graduate students prepared to deal with the new school curricula. Secondly, the tutors will gain experience and confidence in dealing with the new matter and better prepare themselves and the colleges for the wider responsibility for in-service courses for teachers already in the schools.

When the tutors and the colleges have been prepared for the new tasks each country will then be in a position to deal with its in-service teacher training programs internally, at a rate which educational policy and finances make desirable.

Secondary Teachers

As much of mathematics education at secondary level is carried on by expatriate teachers, a large in-service training program at this level was not felt necessary. Rather it seemed important that, when recruiting expatriate teachers, proper experience and qualifications in new mathematics must be demanded. Despite this, it was felt that older indigenous teachers would require some help. As the numbers of such teachers is few in any one country, a small regional effort could meet the needs.

Teaching Materials

A good college text on which mathematics tutors can base their work is necessary. The Basic Concepts (4 volumes) of the Entebbe Series were prepared to serve this purpose, but too much material is included; the material needs adaptation to suit local purposes; the commercial volumes are too costly and books are generally unavailable. A new text, adapted from Basic Concepts, is required and should be published in Africa and made readily available at a reasonable cost.

Other College Aids

The college tutors are greatly in need of other teaching aids to assist them in teaching the new courses. The tutors in the colleges and their students have little or no experience with the new mathematical content or the teaching approaches being recommended. The tutors need teaching aids to support their teaching of the mathematics and require some visual means to demonstrate to their students good classroom procedures for dealing with the new matter in the primary school.

The pilot films already produced by the African Mathematics Program and the additional films being planned could serve well this latter need. The audio-tapes presently being made by the African Mathematics Program will help the tutors considerably as they begin to teach the new courses.

Secondary School Texts

The four countries have had a varied experience in teaching modern mathematics at secondary level. Ethiopia has become deeply involved with the Entebbe Mathematics Series and has already published some 30,000 copies of Form 1 and Form 2 texts at its own expense. Kenya and Uganda have worked in some depth with the East African School Mathematics Project (EASMP) material. Tanzania has had considerable experience with EASMP and with the Entebbe books in all classes of the secondary school. It is now anxious to make use of the experience gained in developing a book specially for East Africa. It is anticipated that the new East African texts will make much use of the original Entebbe material.

In the discussions in Nairobi there was a general agreement that the experience gained in the use of the new texts should be reviewed, that the results of the experimental teaching should be examined and that an East African secondary text which would respond to the experimental findings and which would reflect East African school conditions should be prepared.

Qualified Africans and others who have taught in the region for a considerable time should examine the experimental texts already in use as well as other texts such as the books of the Joint School Project, to consider the production of a secondary series which will reflect the experience gained and satisfy better the local needs, local conditions and the educational

background of local teachers. There is a sizeable cadre of Africans and others in the region who have assisted in writing the original Entebbe texts and adapting the School Mathematics Project materials.

Subsidiary Mathematics

There is an urgent need throughout the region for a new mathematics text to cover the A level subsidiary mathematics course. This is a course taken by students who do not intend to continue their study of mathematics further, but require to use mathematics in their areas of specialization. These are students who take courses in biology, chemistry, physics, economics, social sciences, etc. They far outnumber those who specialize in mathematics.

The increased impact of mathematics on other disciplines is making it more and more urgent that sixth form students are offered mathematics courses which will prepare them for their further studies. The meeting at Nairobi was of the opinion that a common core of mathematics could be identified for a course which would satisfy most needs. A united effort could not only identify this 80% mathematical common core, but could also prepare a text with the help of biologists, chemists, etc., which would benefit all.

Primary School Texts

The experimental texts of the Entebbe Primary Series had been used extensively in Tanzania, Kenya and Ethiopia. Kenya has already initiated an adaptation for experimental purposes, Ethiopia is completing an Amharic translation and adaptation; Tanzania has almost completed its Swahili translation. In Uganda the texts have only been used in some training college primary schools.

However, a new situation has been created by the East African decision to change to metric measures. This decision will bring about some basic changes in primary school mathematics. In the first place, a certain amount of re-writing is necessary to introduce the new units of measure. Moreover, one anticipated consequence will be a real saving in teaching time as work in vulgar fractions is decreased and work on decimal fractions is introduced earlier. These changes make possible the introduction of additional topics or the accelerated introduction of existing topics.

There is a very strong feeling that solutions to these common problems arising from the change in units of measure should be sought through regional discussions.

Training of Local Supervisors

Local supervisors in Ethiopia and Tanzania carry much of the responsibility for bringing about curriculum change. There are indications that local supervisors in Kenya and Uganda will also have this responsibility. These supervisors visit teachers in classrooms and help them in their work. They organize and participate in in-service courses. They are the link between the Ministry, the colleges and the teachers. The success of any program for implementation of curriculum reform will depend on the ability of the supervisors. A necessary task is the training of these supervisors and guiding them in the work of curriculum reform in mathematics. In many ways their work is similar to that of the training college tutors. Similar courses are necessary.

III. PROPOSED COURSE OF ACTION

The four main tasks identified were:

- A. The introduction of modern mathematics into training colleges through the creation of a new syllabus, the publication of a suitable textbook and tutor in-service courses.
- B. The mathematical re-education of local school supervisors.
- C. Development of a new Primary Course based on a new metric system.
- D. The publication of a common secondary text adapting and incorporating existing experimental texts, the development of a course and text for subsidiary mathematics and the preparation of secondary teachers in the region through in-service courses.

The availability of manpower to undertake these tasks was considered.

In the four countries there are people with the mathematical and pedagogical strength who can contribute to the work. The number of such people increases yearly through programs planned by the Ministries. Local involvement in the African Mathematics Program, its workshops and especially participation in its ABC Institute, the work done in connection with the East African School Mathematics Project, and with the Tanzanian, Kenyan and Ethiopian translations and adaptations of the Entebbe Primary Series have all helped to create cadres of people who can be called upon to assist.

Nearly all of these people, however, are already engaged in essential work from which they cannot be released or replaced. None of the countries will be able to increase sufficiently its present staff commitment to meet the proposed needs although those who are capable will be available for short periods of time as lecturers or seminar leaders in institutes or as participants in writing workshops.

There was general agreement that expatriate assistance will be necessary if any action is initiated along the lines suggested.

Expatriate Mathematics Educators

Four expatriate mathematicians working over a period of five years will be required to supervise and carry out the necessary work. In view of the other mathematical needs of the area the educators selected will not only be competent to do the general tasks but would have special competence in particular topics. Thus one will have a special interest in testing, one an interest in audio-visual work, one an interest in lower primary education and one in upper primary classes. They will maintain close contact with the Ministries of Education, the local curriculum development centers, the East African Council of Education, the East African Examination Council and other organizations doing related work.

The educators will work together in the four countries but would have separate areas of responsibility. Co-operating with Ministry officials and educators they would assist each other at leadership courses for tutors and local supervisors which will be held in all four countries and will have mixed national participation.

Location

The educators would be located at:

- (a) The Ministry of Education in Addis Ababa
- (b) The Kenya Institute of Education
- (c) The Institute of Education, Dar es Salaam
- (d) The National Institute of Education, Makerere

Although situated at these locations the educators would not undertake teaching loads or assume normal administrative responsibilities. Their work would be aimed directly and exclusively towards teacher training college tutors at their colleges and local supervisors.

A. Introduction of Modern Mathematics Courses into Training Colleges

It is estimated that more than one hundred tutors and one hundred local supervisors will require in-service courses. Kenya, Uganda and Tanzania are consolidating their teacher training organizations, some colleges are being increased in size and some up-graded in the quality of their staff and graduates.

Three main activities are proposed:

- (a) The mathematical re-education of college tutors through a continuing series of in-service courses linked by correspondence courses, and the provision of continuing assistance to college tutors as the new courses are introduced;
- (b) The preparation of a new training college syllabus in mathematics and the publication of an adapted textbook which would be used with the new syllabus;
- (c) The provision of films and audio aids, such as tapes, for use in pre-service and in-service courses.

(a) The mathematical re-education of college tutors would be the main task of the mathematical educators. Each educator would be expected to:

- (i) Subdivide his area of responsibility so that over a period of five years, extended visits of one or two weeks duration are made to each college to assist the tutor in introducing the new courses into the college;
- (ii) On the basis of this subdivision and time schedule, visit colleges in his area and get to know the tutors, their students and the conditions under which they work;
- (iii) Organize and take part in in-service institutes for tutors from his own area and assist in institutes organized by his colleagues;
- (iv) During and following the institute, working in co-operation with his colleagues, maintain contact with the tutors through correspondence and correspondence courses and visit when necessary and possible;
- (v) In consultation with Ministry officials and the East African Examination Council undertake work in testing or audio-visual aids.

It is clear from the foregoing that the Ministries must be prepared to release tutors to attend the courses. However, one would expect that the courses would be held during vacations. It is also clear that the educators must maintain close contact with the Ministries, keep them informed about plans and the development of the work, and respond to their needs in so far as they are related to the terms of their appointment. Close contact must also be made with other organizations involved in this educational area, e.g. other international programs involved in teacher education, local and expatriate audio-visual groups, the local examination section and the East African Examination Council.

(b) Preparation of a New Syllabus: Although it seems unlikely that all four countries will wish to have identical syllabuses, it is possible that in view of the structure of mathematics itself and the common needs of primary school mathematics, the syllabuses will be very similar. Thus, a common textbook should meet needs which vary only slightly.

Plan of action: A meeting of representatives of the four countries is necessary. This meeting would be organized as a writing workshop which would not only outline the syllabuses but also begin the preparation of a text to assist the tutors to introduce the new syllabuses. The workshop would undertake the following tasks:

- (i) Prepare outlines of syllabuses which would introduce modern mathematics into the colleges and improve teaching approaches.
- (ii) Examine existing teacher training texts to identify items which could be adopted or adapted to satisfy the needs of the new syllabus. In particular, it is recommended that the writing group should examine the Basic Concepts (4 volumes) of the Entebbe Series and the Wisconsin/Northern Nigeria adaptation of these texts, the Handbook for Primary Teachers (Entebbe Series) and the Tutors' Sourcebook presently under preparation for the Entebbe Series.

- (iii) Undertake such adaptation or rewriting as is found necessary after the identification of needed topics. It was thought that this task will be mainly one of selection and that not much rewriting would be required.

The four mathematics educators, working with two representatives from each country and one representative of the African Mathematics Program, should be able to complete this preliminary work in a six-weeks workshop. A full time editor could then prepare the test for publication. Such a workshop could take place in July/August 1970.

(c) Provision of Audio-visual Aids: One of the mathematical educators will have a main responsibility in this area. It is expected that he will review audio-visual aids already existing in Africa and in other countries, assess their suitability and make suggestions concerning their procurement. Experience indicates that in addition to any aids obtained from non-African sources there is a great need for visual and audio aids prepared specially for African tutors. Such aids should show African children and schools and be aimed at tutors and students and the educational background from which they have come. In other words - and especially with regard to films - aids to which they themselves can relate and which reflect both the African scene and African educational conditions.

The three films of the African Mathematics Program already produced and the tapes presently in production are the initial efforts to meet these conditions. Early reports from tutors on the use of these aids have been very good and have included strong requests for more. The heavy cost of film making is appreciated but as there is a demand from many countries, it is hoped that different regions can combine to satisfy this need. The existing films and tapes are available at reasonable cost.

B. The Mathematical Education of Local School Supervisors

In Ethiopia and Tanzania the local school supervisors have become the main agents for change in the schools and for the maintenance of good standards of education. Both countries have been relying on these supervisors to initiate the changes in mathematics curricula. The supervisors in both countries have assumed responsibility for setting up in-service courses and for teaching in these courses.

Kenya and Uganda have also begin to increase the number of available supervisors and to enlarge the responsibilities of the people in the field so that more time can be given to professional matters.

In all four countries these local supervisors are greatly in need of a leadership course in mathematics education to equip them to cope with their responsibilities. Their need is two-fold:

- (a) Their mathematical background needs to be improved;
- (b) They require guidance and assistance in setting up in-service courses.

Basically, these needs are the same as those of the training college tutors. It is proposed therefore that the local supervisors be included in the training college tutors program and that there should be added to this program special emphasis on the necessary content and ways of setting up in-service courses for teachers.

C. Development of a New Primary Course Based on the Metric System

The Entebbe Primary Series has proved useful in Ethiopia, Kenya and Tanzania as a means of initiating curriculum reform at primary level. However, the decision to change to metric units has made an immediate review of the content of the series necessary. The three East African countries and Ethiopia now require texts using the metric units, de-emphasizing the use of vulgar fractions and putting much heavier and earlier weight on the decimal system.

It is proposed that the countries unite to consider:

- (a) How the metric units should be introduced into the syllabus
- (b) To what extent work on vulgar fractions can be decreased
- (c) How much earlier work on decimal fractions should be introduced
- (d) How much more work on decimal fractions is necessary
- (e) How best to use time saved in the changes:
 - (i) What new topics can be introduced or
 - (ii) Should existing topics be introduced earlier.

Standards III, IV and V are likely to be most affected by the proposed changes. However, these standards cannot be looked at in isolation. The whole primary school syllabus will be affected.

These matters should be the concern of people invited to participate in the same workshop which prepares the teacher education text. Although it is expected that the general mathematical development of the Entebbe Primary Series will still be the base of the new work and that the major writing effort will be confined to the middle standards, some three or four workshops will be necessary before this task is completed.

Participants

The participants involved in this work should include:

- (i) A mathematician who is fully aware of the mathematical implication of the work being reviewed.
One of the mathematicians who helped to plan and write the Entebbe Primary series would satisfy this condition most adequately.
- (ii) People with experience of primary school mathematics.
Each country will be expected to send two senior people, with authority, and with this necessary experience.
- (iii) People with experience in writing primary school texts.
Each country will be expected to send two people. Former participants in the African Mathematics Program's Primary Writing Group or people who have themselves produced commercial texts would be most suitable. If any country does not have two such people, former participants in the ABC Institute should be sent instead.

D. The Publication of a Common Secondary Text

While the four countries are interested in the review of the existing secondary materials and the exchange of views on the experience gained in teaching these materials in the classroom, only two are immediately interested in the preparation of adaptations based on the review and experiential experience. All four countries are deeply interested in developing a course and materials for a subsidiary mathematics course at A level for students in biology, chemistry, social science, etc.

It is proposed that these tasks be undertaken at the workshops which prepare the teacher education and primary texts. Prior to the first workshop, papers will be submitted from people in various disciplines to identify the necessary mathematical background for someone entering a university study in the discipline. These papers will be the core papers for the development of the subsidiary mathematics course.

Participants

- (i) University mathematicians with experience in the preparation of secondary school texts. Mathematicians who have been involved in the writing of the Entebbe Secondary Series or the East African School Mathematics Project have this necessary experience. Five such people might be adequate. Three would be concerned with the preparation of the Subsidiary Mathematics Course.
- (ii) People with experience in secondary school mathematics. Each country will be expected to send one person with authority and experience.
- (iii) Secondary school teachers with experience in teaching and (if possible) in writing secondary texts. Each country would be expected to send three such people. Former contributors to the Entebbe Secondary Series and the East African School Mathematics Project would be most suitable.

The manuscript for one year of school education can be completed each year and in the first year the first draft of a Subsidiary Mathematics Course. Continuing pre-publication tasks will be carried on subsequent to the workshops. In the second and third years participants would include sufficient people from other disciplines to complete the Subsidiary Mathematics Course.

Publication Arrangements

An important inhibiting factor operating against curriculum reform is the heavy cost of supplying schools and teachers with new textbooks. When the changes are introduced gradually, only small printings of the new texts are necessary and the unit cost becomes very heavy. On the other hand, when, as in a structured subject like mathematics, changes must be made over large areas so that children transferring from school to school do not suffer, there are immediate heavy expenditures which

the countries find difficult to meet. The countries are willing to incur some expenditures but low budgets cannot meet the extraordinary expenditures involved. Some means must be sought to make new textual materials available at an acceptable price.

The printing facility being developed by UNESCO at Yoandé in the Cameroons is well suited to solve this difficulty. This multi-national effort, involving technicians appointed and supported by an international agency, and gifts of paper and machinery, should not only keep down costs of books, but the facility is also particularly suited to assist in the publication of texts for a multi-national program such as is being suggested for Ethiopia, Kenya, Tanzania and Uganda.

The use of the Yoandé facility was discussed at the Nairobi meeting. It was agreed that if these presses are used and costs are reduced as expected, the countries would be able to absorb the expected additional expenditures arising from the publication and distribution of the texts prepared at the Workshops.

Continuing Research

The tutor education program and the proposed publications will not provide any final answer to mathematics in the region. There is a continuing need for research and for investigation of better methods of teaching mathematics and identifying the most suitable mathematics for the countries involved. A necessary part of any regional program in mathematics must be the development of a research facility which will

evaluate existing programs and will be concerned constantly with the development of a mathematics education, which is flexible and which will respond to the changing needs of such developing countries.

The mathematics educators will be expected to interest themselves in setting up such a facility and co-operate with local personnel who are appointed to undertake this work. The mathematics educator with special interest in testing will have some responsibility in this matter. In this connection, it is anticipated that during the period of this program special funds will be needed to assist in the creation of a mathematics section for a regional curriculum research center.

Ethiopia, Kenya, Tanzania, Uganda

Commitment to Implementation of Mathematical Curricula Reform

Ethiopia

Commitment: The Vice-Minister for Education has decided that modern mathematics will be introduced into all schools as soon as possible.

Involvement: A Ministry official has been appointed to supervise the reform movement. Twenty thousand reprints of the Secondary C One and C Two texts have been undertaken by the Ministry at its own expense. These texts are now being used in all Grade Nine and Ten classes throughout the country. An Ethiopian adaptation of Entebbe Primary Four text approved by the Program is being produced for introduction into Grade Seven classes. An Amharic translation of the Primary One texts is almost completed. In all a total of almost 700,000 adapted texts have been published locally.

Personnel: Mr. Yohannes Menkir of the University, who is on the Steering Committee and Ato Dilnesahu Bisrat in the University have participated in the ABC Institute, Workshops and three country in-service institutes. Five Ethiopians, altogether have assisted in preparing the experimental materials. Eight tutors and teachers took part in the ABC Institute.

Institutes: Four large Teacher Training Institutes have been held. One of these had some 70 to 80 district administrators who will be responsible for introducing the materials into Grade Seven and the primary schools.

Co-operation: The Peace Corps has appointed a volunteer to assist the Ministry official in supervising the reform throughout the country. Three participants in the Yale Five-Year B.A. Program sent by the African Mathematics Program have assisted the Ministry.

Kenya

Commitment: In discussions with the Chief Education Officer and the Chief Inspector of Schools, it was clear that full implementation of mathematical curriculum reform is being planned. Shortage of staff and finance is delaying further action although yearly in-service courses for teachers are being offered.

Involvement: Some 420 classes are now using Entebbe texts or adaptations of Entebbe texts in Grades One through Seven. A Kenyan in the Institute of Education is responsible for supervising this work (based on 1968 information). East Africa School Mathematics Project is in use in some secondary schools up to Form IV level.

Personnel: The Chief Inspector of Schools attended two Workshops as a participant. Three expatriates and five Kenyans including a University lecturer, have also helped in writing the materials. One of the expatriates is still in Kenya. Four have taken part in the ABC Institute.

Institutes: An Institute has been held every year since 1963 to help teachers with the Primary experimental materials. An additional Secondary School Institute was held in 1967 and in 1968.

Co-operation: Individual Peace Corps volunteers are using the materials in Secondary schools. The mathematicians appointed by the Teacher Education for East Africa Program administered by Columbia University have worked closely with the Program.

Tanzania

Commitment: At a meeting in 1967 attended by the Chief Education Officer, the Chief Inspector of Schools, a Ministry Official, an AID representative and two representatives of the African Mathematics Program, Tanzania's future plans were discussed in some detail. Six years ago Tanzania prepared a nine-year plan to implement curriculum reform in mathematics throughout the schools and colleges. The timetable of this plan is being closely adhered to. Tanzania is firmly committed to introducing modern mathematics into all its schools.

Involvement: Swahili adaptations of the Entebbe texts up to Book Five have been prepared and published without outside assistance. In-service institutes, organized centrally and locally, for teachers, tutors and district administrators have made possible the introduction of the new texts into all Primary One classes in 1968. Some 90 classes at Secondary level are using Entebbe texts and another 60 or so are using adapted School Mathematics Project texts. A Tanzanian in the Ministry supervises the experimental work. Another Tanzanian in the Institute of Education is responsible for the Swahili translations (based on 1968 information).

Personnel: Prof. J. E. Phythian, head of the Mathematics Department, Dar Es Salaam University College, is a member of the Steering Committee of the Program. The Chief Planning Officer in the Ministry attended four Workshops as a participant. Altogether six people from Tanzania have helped to write the experimental texts. Thirteen tutors and teachers took part in the ABC Institute.

Institutes: Over the last six years very many Primary Teacher Training Institutes have been given. Each year since 1966 large Secondary In-service Institutes have been given in the University.

Co-operation: Peace Corps volunteers have taught the Entebbe materials at Secondary level. The T.E.E.A. appointee to the Institute of Education works very closely indeed with the Tanzanians responsible for the reform program.

Uganda

Commitment: Although there appears to be the desire, no firm action to implement mathematical curriculum reform at Primary level has yet been taken. At Secondary level many schools are using modern mathematical materials based on the Schools Mathematics Project. However, there is a firm commitment from the National Institute of Education to use the Entebbe materials in all Teacher Training Colleges. Unfortunately, the system is so loose that this objective is proving difficult to achieve.

Involvement: A syllabus based on the Entebbe Teacher Training series has been sent to all colleges. All practicing schools attached to the training colleges have been instructed to introduce the Entebbe texts into their lower classes. Textbooks have been sent to satisfy this need.

Personnel: Mr. Paul Mugambi of Makerere College is a member of the Steering Committee of the Program. Four Ugandans have helped to write the experimental materials. Two expatriates from Uganda also assisted. Four tutors and teachers took part in the ABC Institute.

Institutes: Five Primary Teacher Training Institutes have been held to help teachers use the experimental texts. Some Secondary Institutes, number unknown, have also been given.

Co-operation: There has been close co-operation with the appointee of the T.E.E.A. Program administered by Columbia University. He is on the faculty of the National Institute of Education.

SUMMARY of DISCUSSIONS
at a
SOUTHERN AFRICA REGIONAL MEETING
on
MATHEMATICS

Place of Meeting: Roma, Lesotho
Date of Meeting: August 21, 1969

People Present

- S. H. Abdoullah, UNESCO expert in mathematics
Ministry of Education, Lesotho
- V. M. Bam, School of Education, U.B.L.S.
- Austin Higgins, Mathematics Adviser, Swaziland
- A. W. Kgarebe, Senior Education Officer, Botswana
- I. J. Mohammed, Mathematics Department, U.B.L.S.
- M. M. Mohapelo, School of Education, U.B.L.S.
- A. M. Moka (Mrs.), Mathematics teacher, High School, Lesotho
- F. I. Pakose, Inspector of Schools, Lesotho
- T. s.Thelejane, School of Education, U.B.L.S.
- J. B. Thomas, Primary Mathematics Adviser, Botswana
- J. D. Turner, Principal, School of Education, U.B.L.S.
- B. S. Waagen, School of Education, U.B.L.S., Swaziland representative
- H. P. Bradley, Director, African Mathematics Program
- William Ted Martin, Massachusetts Institute of Technology
Chairman, African Mathematics Program

COMMON PROBLEMS

Discussions at the Roma meeting were confined to consideration of common problems which could be solved through regional assistance. Three main topics were discussed:

- (a) Teacher Education: In-service or pre-service
- (b) Provision of teaching materials, textual and non-textual, at primary, secondary and teacher training levels
- (c) Training for local supervisors

Teacher Education

In-service

The main obstacle to curriculum change is the difficulty of retraining the teachers, especially the primary teachers, presently in the schools. Not only are the teachers in the schools unable to deal with the new matter and the new techniques, but each year the training colleges are turning out teachers who are still not conversant with the new mathematics and the activity methods associated with curriculum reform.

Two factors affect the in-service teacher training problems. Firstly, if the changes desired are to take place within a reasonable time rather than being spread over fifteen to twenty years, it will be necessary to run many in-service courses each year. Secondly, none of the countries has sufficient personnel to run the number of courses which will be necessary.

The first task of implementation is, therefore, a leadership training program involving teacher training college tutors, district education officers, section heads, inspectors and headmasters. Such a leadership training program should create in many locations a cadre of people capable of giving in-service

courses to teachers. The teacher training colleges would appear to be the natural venues for such courses and it will be necessary to ensure that the tutors in these colleges are competent to deal with the new mathematics and that the colleges are preparing their own students for the changes being considered .

Pre-service A necessary part of this leadership training program will be the provision of professional help for tutors in drawing up new syllabuses for the colleges and guidance and assistance in introducing these new syllabuses into the colleges. Thus two ends will be served. In the first place, the colleges will begin to graduate students prepared to deal with the new school curricula. Secondly, the tutors will gain experience and confidence in dealing with the new matter and better prepare themselves and the colleges for the wider responsibility for in-service courses for teachers already in the schools.

When the tutors and the colleges have been prepared for the new tasks each country will then be in a position to deal with its in-service teacher training programs in co-operation with district education officers, section heads and headmasters at a rate which educational policy and finances make desirable.

Secondary In-service

Much of mathematics education at secondary level is carried on by expatriate teachers. Many of these are South African Africans who may be resident in the countries for some considerable time. These teachers and other more temporary appointees require some help. In-service courses are necessary. A regional effort could meet the needs.

Secondary Pre-service

There is clearly a need to increase the number of local secondary school teachers in all subjects. The need in mathematics is probably the most obvious. An advanced teacher training college or an extension of the work presently being done in the University would appear to be very necessary.

Teaching Materials

A good text on which mathematics tutors can base their in-service and pre-service courses is necessary. The Basic Concepts (4 volumes) of the Entebbe Series were prepared to serve this purpose, but too much material is included; the material needs adaptation to suit local purposes; the commercial volumes are too costly and books are generally unavailable. A new text, adapted from Basic Concepts, is required and should be published in Africa and made readily available at a reasonable cost.

Other College Aids

The college tutors are greatly in need of other teaching aids to assist them in teaching the new courses. The tutors, the teachers and students have little or no experience with the new mathematical content or the teaching approaches being recommended. The tutors need teaching aids to support their teaching of the mathematics and require some visual means to demonstrate to their students good classroom procedures for dealing with the new matter in the primary school.

The pilot films already produced by the African Mathematics Program and the additional films being planned could serve well this latter need. The audio-tapes presently being made by the African Mathematics Program will help the tutors considerably as they begin to teach the new courses.

Secondary School Texts

All four countries have shown interest in the materials of the School Mathematics Project (SMP) and the East African School Mathematics Project (EASMP). The materials are being used in some schools in all four countries. Some interest has also been shown in the Entebbe texts, but they are not being used to any great extent.

In the discussions in Roma there was a general agreement that the experience gained in the use of the new texts should be reviewed, that the results of the experimental teaching should be examined and that a Southern African secondary text which would respond to the experimental findings and which would reflect Southern African school conditions should be prepared.

Qualified Africans and others who have taught in the region for a considerable time should examine the experimental texts already in use as well as other texts such as the books of the Joint School Project, to consider the production of a secondary series which will reflect the experience gained and satisfy better the local needs, local conditions and the educational background of local teachers.

Subsidiary Mathematics

There is a need throughout the region for a new mathematics text to cover the A level subsidiary mathematics course. This is a course taken by students who do not intend to continue their study of mathematics further, but require to use mathematics in their areas of specialization. These are students who take courses in biology, chemistry, physics, economics, social sciences, etc. They far outnumber those who specialize in mathematics.

The increased impact of mathematics on other disciplines is making it more and more urgent that sixth form students are offered mathematics courses

which will prepare them for their further studies. The meeting at Nairobi was of the opinion that a common core of mathematics could be identified for a course which would satisfy most needs. A united effort could not only identify this 80% mathematical common core, but could also prepare a text with the help of biologists, chemists, etc., which would benefit all. The Southern African region could benefit greatly by participating in and contributing to the text proposed for the East Africa region.

Primary School Texts

The experimental texts of the Entebbe Primary Series have been used widely in Malawi. The other three countries have examined the texts and feel that they could be the basis for new mathematics programs in the region. It was the opinion of the Roma meeting that a common primary syllabus could be created and that adapted and revised texts could be prepared using the Entebbe Primary Series.

III. PROPOSED COURSE OF ACTION

The four main tasks identified were:

- A. A leadership training program in mathematics for training college tutors, district education officers, section heads and headmasters.
- B. The development of a common training college syllabus, the production of a teacher training text for use in pre-service and in-service teacher education.
- C. Introduction of new mathematics courses in training colleges.
- D. Development of a new primary course - with suitable texts.
- E. Preparation of a common secondary text (possibly in cooperation with the East African Region) and the development of a course

and text for subsidiary mathematics in co-operation with the East African Region and the preparation of secondary teachers to cope with the new courses.

F. Initiation of an evaluation facility for the region.

The availability of manpower to undertake these tasks was considered. In the four countries there are people with the mathematical and pedagogical strength who can contribute to the work. The number of such people increases yearly through program planned by the Ministries. Involvement in the African Mathematics Program, its workshops and especially participation in its ABC Institute, the work done in connection with the East African School Mathematics Project have helped to create a cadre of people in Malawi who can be called upon to assist.

In the southern African states, where the need is so great, the contribution of local people will be less. It should be possible, however, to call upon the University and the staff of secondary schools which have been using the SMP and EASMP materials.

There was general agreement that expatriate assistance will be necessary if any action is initiated along the lines suggested.

Expatriate Mathematics Educators

Five expatriate mathematicians working over a period of five years will be required to supervise and carry out the necessary work. In view of the other mathematical needs of the area the educators selected will not only be competent to do the general tasks, but would have special competence in particular topics. Thus one will have a special interest in testing, one an interest in audio-visual work, one an interest in lower primary

education and one in upper primary classes. They will maintain close contact with the Ministries of Education, the East African Council of Education and other organizations doing related work.

The educators will work together in the four countries, but would have separate areas of responsibility. Co-operating with Ministry officials and educators they would assist each other at leadership courses for tutors and local supervisors which will be held in all four countries and will have mixed national participation.

Location

The educators would be located at:

- (a) The Ministry of Education in Botswana
- (b) The Ministry of Education in Lesotho
- (c) The Institute of Education, University of Malawi
- (d) Ministry of Education, Swaziland
- (e) The University of Botswana, Lesotho, Swaziland (Co-ordinator)

Although situated at these locations the educators would not undertake teaching loads or assume normal administrative responsibilities. Their work would be aimed directly and exclusively towards teacher training college tutors at their colleges and local supervisors.

Expected Date of Appointment

If the program is funded in January 1970, the five educators could take up their appointment in July/August 1970.

A. Introduction of Modern Mathematics Courses into Training Colleges

It is estimated that more than one hundred tutors and one hundred local supervisors and headmasters will require in-service courses.

Three main activities are proposed:

- (a) The mathematical re-education of tutors, supervisors and headmasters through a continuing series of in-service courses linked by correspondence courses, and the provision of continuing assistance to college tutors as the new courses are introduced;

- (b) The preparation of a new training college syllabus in mathematics and the publication of an adapted textbook which would be used with the new syllabus;
 - (c) The provision of films and audio aids, such as tapes, for use in pre-service and in-service courses.
- (a) The mathematical re-education of college tutors would be the main task of the mathematical educators. Each educator would be expected to:
- (i) Subdivide his area of responsibility so that over a period of five years, extended visits of one or two weeks duration are made to each college to assist the tutor in introducing the new courses into the college;
 - (ii) On the basis of this subdivision and time schedule, visit colleges in his area and get to know the tutors, their students and the conditions under which they work;
 - (iii) Organize and take part in in-service institutes for tutors from his own area and assist in institutes organized by his colleagues;
 - (iv) During and following the institute, working in co-operation with his colleagues, maintain contact with the tutors through correspondence and correspondence courses and visit when necessary and possible;
 - (v) During college visits maintain supervisory contact with district education officers, section heads and selected headmasters who have been involved in the leadership in-service courses and the correspondence courses.
 - (vi) In consultation with Ministry officials, undertake work in testing or audio-visual aids.

It is clear from the foregoing that the Ministries must be prepared to release tutors and staff to attend the courses. However, one would expect that the courses would be held during vacations. It is also clear that the educators must maintain close contact with Ministries, keep them informed about plans and the development of the work, and respond to their needs in so far as they are related to the terms of their appointment. Close contact must also be made with other organizations involved in this educational area, e.g. other international programs involved in teacher education, local

and expatriate audio-visual groups and the local examination section.

(b) Preparation of a New Syllabus: Although it seems unlikely that all four countries will wish to have identical syllabuses, it is possible that in view of the structure of mathematics itself and the common needs of primary school mathematics, the syllabuses will be very similar. Thus, a common textbook should meet needs which vary only slightly.

Plan of action: A meeting of representatives of the four countries is necessary. This meeting would be organized as a writing workshop which would not only outline the syllabuses but also begin the preparation of a new text to assist the tutors to introduce the new syllabuses. The workshop would undertake the following tasks:

- (i) Prepare outlines of syllabuses which would introduce modern mathematics into the colleges and improve teaching approaches.
- (ii) Examine existing teacher training texts to identify items which could be adopted or adapted to satisfy the needs of the new syllabus. In particular, it is recommended that the writing group should examine the Basic Concepts (4 volumes) of the Entebbe Series and the Wisconsin/Northern Nigeria adaptation of these texts, the Handbook for Primary Teachers (Entebbe Series) and the Tutors' Sourcebook presently under preparation for the Entebbe Series.
- (iii) Undertake such adaptation or rewriting as is found necessary after the identification of needed topics. It was thought that this task will be mainly one of selection and that not much rewriting would be required.

The five mathematics educators, working with two representatives from each country and one representative of the African Mathematics Program, should be able to complete this preliminary work in a six-week workshop. A full time editor could then prepare the text for publication. Such a workshop could take place in July/August 1970.

(c) Provision of Audio-visual Aids: One of the mathematical educators will have a main responsibility in this area. It is expected that he will review audio-visual aids already existing in Africa and in other countries,

assess their suitability and make suggestions concerning their procurement. Experience indicates that in addition to any aids obtained from non-African sources there is a great need for visual and audio aids prepared specially for African tutors. Such aids should show African children and schools and be aimed at tutors and students and the educational background from which they have come. In other words - and especially with regard to films - aids to which they themselves can relate and which reflect both the African scene and African educational conditions.

The three films of the African Mathematics Program already produced and the tapes presently in production are the initial efforts to meet these conditions. Early reports from tutors on the use of these aids have been very good and have included strong requests for more. The heavy cost of film making is appreciated but as there is a demand from many countries, it is hoped that different regions can combine to satisfy this need. The existing films and tapes are available at reasonable cost.

Action Proposed: If mathematics programs are set up in two or more regions, a meeting should be convened to consider joint funding for the production of more films similar to those proposed by the Ghana Film Industry Corporation in association with the African Mathematics Program.

C. Development of a New Primary Course

The Entebbe Primary Series has proved useful as a means of initiating curriculum reform at primary level. It is expected that the general mathematical development of the Entebbe Primary Series will still be the base of the new work and that some three or four workshops will be necessary before this task is completed.

Participants

The participants involved in this work should include:

- (i) A mathematician who is fully aware of the mathematical implication of the work being reviewed. One of the mathematicians who helped to plan and write the Entebbe Primary series would satisfy this condition most adequately.
- (ii) People with experience of primary school mathematics. Each country will be expected to send two senior people, with authority, and with this necessary experience.
- (iii) People with experience in writing primary school texts. Each country will be expected to send two people. Former participants in the African Mathematics Program's Primary Writing Group or people who have themselves produced commercial texts would be most suitable. It is probable that the three southern African states will find it difficult to find such people. By careful selection and a properly run workshop, those attending may require some experience in text preparation.

D. The Publication of a Common Secondary Text

The four countries are interested in the review of the existing secondary materials and the exchange of views on the experience gained in teaching these materials in the classroom. All four countries are deeply interested in developing a course and materials for a subsidiary mathematics course at A level for students in biology, chemistry, social science, etc.

It is proposed that these tasks be undertaken in collaboration with the East Africa Region. With regard to the proposed subsidiary mathematics course, prior to the first workshop papers will be submitted from people in various disciplines to identify the necessary mathematical background for someone entering a university study in the discipline. These papers will be the core papers for the development of the new course.

Southern African Participants in East African Secondary Workshop

- (i) Two university mathematicians
- (ii) Two secondary teachers from each country, who have had experience teaching the new texts.

workshops. In the second and third years participants would include sufficient people from other disciplines to complete the Subsidiary Mathematics Course.

Publication Arrangements

An important inhibiting factor operating against curriculum reform is the heavy cost of supplying schools and teachers with new textbooks. When the changes are introduced gradually, only small printings of the new texts are necessary and the unit cost becomes very heavy. On the other hand, when, as in a structured subject like mathematics, changes must be made over large areas so that children transferring from school to school do not suffer, there are immediate heavy expenditures which the countries find difficult to meet. The countries are willing to incur some expenditures but low budgets cannot meet the extraordinary expenditures involved. Some means must be sought to make new textual materials available at an acceptable price.

The printing facility being developed by UNESCO at Yoandé in the Cameroons is well suited to solve this difficulty. This multi-national effort, involving technicians appointed and supported by an international agency, and gifts of paper and machinery, should not only keep down costs of books, but the facility is also particularly suited to assist in the publication of texts for a multi-national program such as is being suggested for Ghana, Liberia and Sierra Leone.

The use of the Yoandé facility was discussed at the Roma meeting and it was agreed that if these presses are used and costs are reduced as expected, the countries would be able to absorb the expected additional expenditures arising from the publication and distribution of the texts prepared at the Workshops.

Continuing Research

The tutor education program and the proposed publications will not provide any final answer to mathematics in the region. There is a continuing need for research and for investigation of better methods of teaching mathematics and identifying the most suitable mathematics for the countries involved. A necessary part of any regional program in mathematics must be the development of a research facility which will evaluate existing programs and will be concerned constantly with the development of a mathematics education, which is flexible and which will respond to the changing needs of such developing countries.

The mathematics educators will be expected to interest themselves in setting up such a facility and co-operate with local personnel who are appointed to undertake this work. The mathematics educator with special interest in testing will have some responsibility in this matter. In this connection, it is anticipated that during the period of this program special funds will be needed to assist in the creation of a mathematics section for a regional curriculum research center.

Malawi

Commitment to Implementation of Mathematical Curricula Reform

Commitment: The Ministry has decided to introduce modern mathematics into all school classes and colleges. At Primary level this may mean a diluted version of the Entebbe texts with a fair amount of traditional material still remaining. Plans to gear Teacher Training Colleges to deal with the changes are presently being considered. These decisions were discussed at a meeting attended by the Chief and Assistant Chief Education Officers, a Ministry official and two representatives of the African Mathematics Program.

Involvement: By 1968 forty-six Primary classes were using the Entebbe texts in a tightly controlled experiment. All eleven training colleges are using the Entebbe Teacher Training Texts. At Secondary level consideration is being given to the introduction of materials from the Schools Mathematics Project.

Personnel: A Ministry official is responsible for supervising the experiments and organizing Teacher Training Institutes. Two Malawians have assisted in preparing the experimental materials. Six tutors and teachers took part in the ABC Institute.

Institutes: Seven Teacher Training Institutes have been given to prepare teachers and tutors to deal with the new materials.

Co-operation: Two mathematicians from the new University of Malawi have assisted in working with the Malawi participants in the ABC Institute.

Botswana, Lesotho, Swaziland

Commitment to Implementation of Mathematical Curricula Reform

Since 1965 there has been a steady stream of official letters from the three countries, expressing interest in the African Mathematics Program and requesting participation. There have also been many letters from the University of Botswana, Lesotho and Swaziland and requests from teacher training colleges, schools and individuals for copies of the Entebbe texts. The program, because of the terms of its contract, was unable to satisfy these requests in full, but inspection copies were despatched.

The following copies of letters are official requests from Ministries asking for participation in the program.

Ref.: D.F.C. 53(5)B

Department of Education,
P.O. Box 39,
MBABANE, Swaziland.
2nd February, 1967.

DRD/NM

Mr. Hugh P. Bradley,
Educational Services Incorporated,
55 Chapel Street,
Newton, Mass. 02158,
U.S.A.

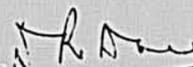
Dear Mr. Bradley,

It is the desire of this Government that I write to you requesting our participation in the African Education Program of Educational Services Incorporated. I am ignorant of the details of such participation, but I have been prompted to write to you after conversations with Professor John Turner who takes a great interest in Swaziland's educational problems and who is aware of our urgent needs in the fields of mathematics and science teaching.

It was with regret that I had to withdraw the candidature of Mr. A.T. Mabedi for the course in Nairobi last year for reasons beyond my control. It is my sincere hope that we shall be able to send two people to participate in your training scheme starting in Nairobi this year.

I would be delighted to receive particulars from you about participation in your program, and about the Nairobi course.

Yours sincerely,



D.R. DAY
DIRECTOR OF EDUCATION



711 71A
1967 FEB 02 10 10 AM
MBABANE

SS.31 GKTC/KGS

EDUCATION DEPARTMENT,
PRIVATE BAG 5,
G A B E R O N E S.
Botswana.

RECEIVED
DATE Feb 20
H. P. B...

15th February, 1967.

Hugh Bradley, Esq.,
African Education Program,
Educational Services Incorporated,
55 Chapel Street,
NEWTON,
MASSCHUSETTES .02158

Dear Sir,

Professor John Turner of the University of Botswana Lesotho and Swaziland has informed us that the USAID has at last indicated that if Botswana were to ask for participation in your African Education Program such a request would be likely to be approved. We are most grateful to USAID for this change of heart and to ESI for all the assistance it has given us in the past.

I, therefore, make a formal application for participation in the African Education Program and for ESI assistance in any available form such as personnel to run courses for teachers or experimental material.

I look forward to hearing from you and shall be happy to answer any questions you may wish to ask regarding this application.

Yours faithfully,



for: DIRECTOR OF EDUCATION.

LESOTHO

TELEPHONE : Maseru 2445
TELEGRAMS : Education, Maseru

MINISTRY OF EDUCATION,
P.O. BOX 47,
MASERU.

All communications to be
addressed to the Permanent Secretary.

Our Ref.
Your Ref.

RECEIVED
DATE *March 6*
H. P. BRADLEY

February 23, 1967.

Mr. Hugh Bradley,
Educational Services Incorporated,
55 Chapel Street,
Newton,
Mass. 02158.

Sir,

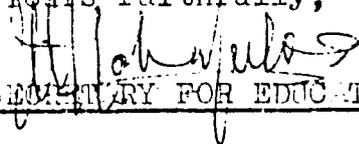
PARTICIPATION IN THE AFRICA EDUCATION
PROGRAMME OF ESI

Professor Turner, Director of the U.B.L.S. School of Education, has informed me of the possibility of our participating in your programme, and my Minister approves of our doing so if this can be arranged.

2. As a result, the Lesotho Ministry of Economic Development has been asked to send an application to ESI.
3. As Professor Turner says, we shall need all the help we can get in introducing our revised primary syllabus and improving the teaching of science and mathematics.
4. The purpose of my letter is both to indicate that this government will be getting in touch with your organization, and to say that the Ministry associates itself with the efforts made by Professor Turner and his colleagues to help our schools, not only to modernize their methods, but to obtain materials which will make this possible.

I am, Sir,

Yours faithfully,


PERMANENT SECRETARY FOR EDUCATION.

Copy : Professor Turner, U.B.L.S. Roma.

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Massachusetts Institute of Technology
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University of Lagos
Lagos, Nigeria

Professor Jerrold R. Zacharias
Massachusetts Institute of Technology
Cambridge, Massachusetts