

Non-Capital Project Paper (PROP)

Country: Africa Regional Project No. 698-11-690-356

Submission Date: June 17, 1970 Original

Project Title: African Mathematics Program

U.S. Obligation Span = FY 1970 through FY 1974

Physical Implementation Span = FY 1971 through FY 1975

Gross life of project financial requirements:

U.S. Dollars \$1,700,000

Cooperating country cash contributions = See text for in kind contributions of cooperating countries

Other donors = See text for description of complementary activities of other donors

A. SUMMARY

The African Mathematics Program (AMP) is designed to promote curricula reform and new approaches to teaching mathematics in primary and secondary schools in English-speaking Africa through development of curriculum materials and teacher training on a regional basis.

Among the many problems confronting African education today is the great disparity between student enrollment in liberal arts, humanities and mathematics and science both at the secondary and university levels. This disparity is much greater in most African countries than one finds in the "developed" countries.

The reasons for this are to be found in inadequately prepared teachers, old-fashioned methods of teaching, non-local examples, adding up to inadequate student preparation in mathematics in primary and secondary schools. This results in much greater risks of failure on secondary school graduation examinations and university entrance exams for those who elect science over humanities. The net effect of this is overproduction in the humanities and an increasingly critical shortage of technical- and science-trained personnel.

Under the research project already undertaken with A.I.D. financing, curriculum reform aimed at improving the teaching of mathematics at the primary and secondary level has already had wide impact. It has provided an added stimulant to education authorities in both East and West Africa to undertake reform of the curricula for other subjects in an effort to relate them more closely to African life.

This project proposes to give full impetus to these important initiatives through a program to train approximately 400 mathematics teachers and teacher educators over a five-year period, develop new curriculum materials and teaching aids, and train a competent cadre of people capable of evaluating the training and material production undertaken, and the on-going work of reform which the program will encourage.

The project will be carried out simultaneously in three East African countries, Ethiopia, Kenya and Tanzania and three West African countries, Ghana, Liberia and Sierra Leone. Ministry of Education officials and mathematics educators from these countries explicitly stated at meetings held in Nairobi in August and December 1969 and in Accra in August 1969 that it was their intention to introduce modern mathematics curricula into their schools as soon as possible. At these meetings they requested assistance in implementing reform programs.

Although no direct cash contributions on the part of the cooperating countries are planned, the host countries will provide the salaries and benefits to all the teachers participating in the program, as well as make their facilities available for project implementation. The host countries have also agreed to provide personnel from the ministries of education and the schools to form management committees for the East and West African programs. These committees, which will be primarily African in composition, will gradually take over policy and executive responsibility for the programs. In addition, the countries' purchases of the printed textbooks, and their distribution through the respective school systems are direct contributions to the program.

Total U.S. project inputs will amount to \$1,700,000 for which \$920,000 is for the West African Program and \$780,000 for the East African Program. The project will provide \$910,000 for personnel services, \$95,000 for equipment and supplies, \$12,000 for participant training and \$683,000 for other costs. Details of budget estimates will be found in Annex A.

There are a number of bilateral and multilateral donors who are supporting complementary activities. These are described in the section on other donors. A more comprehensive description of these activities and their relation to the proposed project will be provided in a revised PROP to be prepared during year one of the project.

The reason for planning a PROP revision during the first year of project operation is the transitional nature of the first year. The present project has evolved from a research and development program for African mathematics curriculum reform begun in 1962. This was centrally funded by A.I.D. and terminates on June 30, 1970. The first year of the proposed project, oriented exclusively toward implementation of the reforms, will carry forward some elements of the R&D phase and introduce major new ones. It will be particularly important to assure that the

anticipated African program support at both the school and ministry level is provided and that the African direction and management of the program develops along planned lines.

B. SETTING

Under an A.I.D. research and development contract, the Education Development Center (EDC) has received \$2.9 million since 1962 to develop in cooperation with African mathematicians and educators new mathematics curriculum materials and initiate training programs for African teachers. Sixty-six volumes of experimental primary and secondary mathematics textbooks and teaching guides have been developed. The EDC introduced new methods and approaches to mathematics teaching into a number of African countries and experimental programs have been developed in Sierra Leone, Tanzania, Liberia, Ghana, Nigeria, Kenya, Uganda, Malawi and Zambia.

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. The Ford Foundation and other non-profit foundations 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 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. The work of their committee has also affected fifteen other countries which use the textbooks produced. Similar EDC programs for the reform of mathematics, social studies and elementary science curricula are presently affecting the education of many American children.

The African Education Program

In 1961, Educational Services Incorporated (ESI), now EDC, organized a six-week meeting at which sixteen 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 curriculum 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 develop 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 with African mathematicians in Accra and Ibadan, a mathematics workshop was held at Entebbe, Uganda, in July and August 1962.

The Workshops

In the first Program Workshop at Entebbe, a plan for an African mathematics program was developed along with a 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 (first year of primary school) and Form One (first year of secondary school or seventh grade) and a model of a School Certificate Examination based on modern mathematics (high school graduation examination), 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 teacher 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. Their purpose was to revise the Primary Four tests, to consider a syllabus and to prepare specimen examination papers for teacher training colleges, and prepare a model examination for the Advanced Mathematics A-level.

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.

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 71 in-country institutes have been held. The African Mathematics Program has provided a total of 47 lecturers for these courses. These 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. Some 4,700 teachers and teacher educators have been introduced to these materials at institutes. The children in nearly 2000 classes in ten African countries are being taught this modern approach to mathematics.

ABC Institute Program

In addition to the in-country institutes described above, the ABC Program, which operated for three summers beginning in 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 fellowtutors in smaller colleges. These tutors can then, in turn, be able to give suitable training to the teachers in the schools or about to enter the schools.

A pilot teacher education film project under this program has resulted in three films which have been distributed to mathematics tutors who attended the ABC Institute Program. Sixteen audio-tapes on various aspects of mathematics teaching 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.

Book Production

One of the most tangible results of the research and development phase of the African Mathematics Program has been the production of experimental textbooks on new mathematics. Now there is a full series of experimental mathematics textbooks for Standard One through Standard Six, with an Entebbe Primary Series Guide and for the six classes at the secondary level. In addition, a battery of tests has been prepared covering the work of several classes. It is now possible for African countries to develop their own texts from this experimental material. It is for this task that they have requested assistance.

Since the program started, a total of 63 volumes of experimental textual materials has been published. Some 500,000 texts have been distributed free of charge in the 10 participating African countries. Under the research and development contract, EDC was limited to publishing 30 class sets of experimental materials averaging 40 books per set. In addition, almost one million copies of adapted Entebbe texts have been printed by Ethiopia, Ghana, Kenya, Nigeria and Tanzania. During this eight-year period, 186 individuals, among them 162 Africans and 75 Americans, have helped to write the mathematical texts. This is another indication of the importance African educators attach to the mathematics program.

Proposed Five Year African Mathematics Program

The research and development phase of the African Mathematics Program is scheduled to be completed in June 1970. In order to realize the maximum benefits from this phase of the program it is proposed to begin a five-year, full-scale implementation phase early in FY 71. Six countries--Sierra Leone, Liberia and Ghana in West Africa, and Ethiopia, Kenya and Tanzania in East Africa--are committed to the introduction of modern mathematics curricula into their schools and have requested assistance in so doing. The four other countries who participated in the R & D phase have for various reasons not decided to participate in the implementation phase.

All of the six countries have allocated personnel and financing for teacher training institutes to prepare teachers to undertake the experimental work. All of them participated in the leadership training program known as the ABC Institute.

The program which is proposed here not only will insure the maximum utilization of the experimental materials prepared in the R&D phase, but will further the work of mathematics curriculum reform and at the same time establish the human and institutional framework within which the reform work may continue after the five-year period. Regional funding for the project is proposed because three of the main problems arising from the implementation of mathematics reform are common to the six countries and can be solved through regional assistance. These common problems are:

- (a) Teacher education: in-service and pre-service.
- (b) Provision of teacher training materials, textual and non-textual and a review - with possible preparation - of a revised adapted secondary series.
- (c) Training for local supervisors of teachers.

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 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 places for training 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 and the mathematics teacher trainers (tutors) in the colleges are the people strategically placed to give the courses. The first task of the program is therefore the retraining of the college tutors to enable them to deal with the new curricula.

Pre-service

A necessary part of this leadership training program for tutors will be the provision of professional help in drawing up new syllabi for the colleges and guidance and assistance in introducing these new syllabi 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 policy and finances make possible.

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 is not felt necessary. It does seem important that, when recruiting expatriate teachers, proper experience and qualifications in new mathematics must be demanded. It is felt, however, that older indigenous teachers will require some help. As the numbers of such teachers in any one country is small, a modest regional effort will 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 Kutebba Series were

prepared to serve this purpose, but too much material is included, the material needs adaptation to suit local purposes and the commercial volumes are too costly. New texts, adapted from the Basic Concepts volumes, are 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 new courses. The tutors in the colleges and their students have little or no experience with the new mathematics 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 new matter in the primary school.

The pilot films already produced by the African Mathematics Program and the additional films being planned could well serve 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 three countries in East Africa 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 has worked in some depth with the East Africa School Mathematics Project (EASMP) material. Ethiopia and Tanzania feel rather strongly that they should share their experience in the reform of secondary mathematics curricula and during the period of the program would like to confer and consider what changes and adaptations are necessary and what form a revised adapted text should take and whether a joint effort in this area is possible.

The secondary schools in the three West African countries 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 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 both regions for a new mathematics text to cover the A level subsidiary mathematics course (post secondary university preparation). This is a course taken by students who do not intend to continue their study of mathematics further but must be equipped to use mathematics in their areas of specialization. These are students who specialize 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 of August 1969 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, physicists, etc., which would benefit all.

Training of Local School Supervisors

Local supervisors in many of the countries carry major responsibility for bringing about curriculum change. 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 in mathematics will depend heavily on the ability of supervisors. In many ways their work is similar to that of training college tutors and similar courses are necessary for them.

Major Project Tasks

In order to achieve these training objectives, the following tasks can be identified:

1. 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.
2. The mathematical re-education of local school supervisors.
3. In West Africa, the publication of a common text for each year of primary school which would make allowances for national differences and which would be readily available at a reasonable cost.
4. In West Africa, the publication of a common text for each year of secondary school adapting and incorporating the existing experimental texts, and the preparation of secondary teachers of the region through in-service courses.
5. The publication of a common primary and secondary text in East Africa is not contemplated due to the language differences: Amharic in Ethiopia, Swahili in Tanzania and English in Kenya.
6. The review of the secondary mathematics experience in East Africa and consideration of the preparation of a revised adapted text at this level, however, may be considered if the reviews so indicate in East and West Africa.
7. The preparation of a Subsidiary Mathematics Text.

8. The creation of evaluation expertise to permit an ongoing evaluation of materials produced during the period of this program and thereafter in both East and West Africa.

The availability of manpower to undertake these tasks was considered. In the six 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 Project, its workshops and especially participation in its ABC Institute, the work done in connection with the East African School Mathematics Project, 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. 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. Foreign technical assistance will therefore be necessary to initiate actions along the suggested lines.

In West Africa, 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 will be mathematically competent and educationally experienced but, in addition, one will have special training in testing and the other a special concern with teaching aids, visual and aural. It is expected that they will maintain close contact with the ministries of education, with the West African Examinations Council and other organizations in the countries concerned with audio-visual work. They will work together in the three countries. Cooperating with ministry officials and educators they will assist at leadership courses for tutors which will be held in all of the three countries with mixed national participation. Jointly, they will prepare and supervise the correspondence courses which will link the continuing institutes. The educators will be put to best use if one is located at the University of Sierra Leone (Njala Campus) and the other at the University College at Cape Coast in Ghana. Although located at these universities they would not undertake teaching loads in the normal university schedules. Their work will be aimed directly and exclusively towards teacher training college tutors and their colleges.

During the first year of the program the expatriate mathematics educators, in consultation with the respective ministries of education will identify teachers, tutors and others who can assist in running the leadership training program and can contribute at the proposed workshops, collaborating with writers who have already had experience in text production through participation in other writing programs including the research phase of this program.

Prospective members of the proposed evaluation team will also be identified in this process, a final selection being made after judgments have been made based on their contributions at the first workshop.

Two full time African editors will be employed to work with the materials which come from the workshops. These appointees will prepare the texts for publication, visit training colleges and schools, consult with tutors and teachers and collaborate closely with the mathematics educators who, along with mathematicians on the management committee, will be their mathematics consultants. Despite the difficulty of freeing competent Africans from other pressing tasks it is the intent of the program to appoint Africans as editors.

In East Africa, only one expatriate mathematics educator will be assigned for the first year. However, in the second year and thereafter, a second mathematics educator is necessary to assist in the college and supervise correspondence courses and visitations and to undertake rewriting and editorial work in connection with the preparation of the revised Basic Concepts texts. Both educators will be competent to do the general tasks of the leadership training program and additional special interests will be required in testing, audio-visual work and text book writing. They will maintain close contact with the ministries of education, local curriculum development centers, where they exist, the East African Council of Education, the East African Examinations Council and other organizations doing related work.

The educators will work together in the three countries but will have separate areas of responsibility. Cooperating with ministry officials and educators they will assist at leadership courses for tutors and local school supervisors which will be held in all three countries and may have mixed national participation. Jointly, they will prepare and supervise the correspondence courses which will link the continuing institutes.

The first educator will be located in the Kenya Institute of Education. The second educator, when appointed, will be attached to the Ministry of Education in Addis Ababa.

As in West Africa, these educators will not undertake teaching or normal administrative responsibilities. Their work will be aimed directly and exclusively towards training of college tutors. Their work will involve considerable travel and correspondence outside their country of residence within East Africa.

During the first year of the program the mathematics educator, in consultation with the respective ministries of education, will identify teachers, tutors and others who can assist in running the leadership training program and can contribute at the proposed workshops. Prospective members of the proposed evaluation team will also be identified in this process.

Project Management

Initially, Education Development Center will be manager of the program.^{1/} However, a local administrator, an African, will be appointed for each region as soon as possible, with responsibilities to make detailed arrangements for institutes and workshops, to assist in the control of the correspondence courses and to plan visits to colleges and arrange travel schedules for the mathematics educator. During the early stages of his appointment the local administrator will be assisted to gain experience so that within two years he will be able to take over the overall administration of the program and become its director.

During the first year of the program, it will be EDC's responsibility to investigate ways whereby the total control of the program, financial and administrative, can be handed over to a decision-making regional group composed of Africans with direct links to the respective ministries of education so that within two years EDC will cease to be program manager and will become a resource to the African regional groups.

The Local Administrators

Each local administrator will be appointed by the Management Committee, will be the executive officer of the Committee and arrange for the implementation of its decisions and be responsible for the day to day administration of the program. He will report to the Management Committee and keep its members informed of the programs' progress and activities. He will call for the assistance of local members of the Management Committee to further the program needs in specific countries if administrative or official problems arise.

The Management Committees

The committees will manage the program after an interim period of 1-1/2 to 2 years. This management will entail selection and approval of staff appointed, planning future activities and arranging for the preparation of proposals for continuing funding of the program. The committees will be policy-deciding bodies and will act through their officer - the local administrator.

The committee members from the ministries and institutes of education will hold their membership as representatives of their ministry or institute and not in their own right. Thus they will be considered as official spokesmen at the meetings. It may be expected that in such a situation decisions of the management committee may require further official approval from the ministries or the institutes.

^{1/} We have considered the possibility of another contractor. In view of EDC's unique qualification in this field and its experience with the earlier centrally-funded research project, we recommend selection of EDC.

The Management Committees will normally meet twice a year but will meet more often if the need should arise. At the first meeting of the committee a chairman will be chosen. Initially EDC and the local administrator and later the local administrator will maintain close contact with the chairman who will be responsible for calling both regular and special meetings.

Four areas of competence and responsibility should be represented on the management committees:

- (1) Ministries of education (one from each country)
- (2) Institutes of faculties of education (one from each country)
- (3) Mathematicians (African university and U.S.A. university people with AEP experience).
- (4) Administrative experience (one EDC representative)

This composition has been reflected in the membership of the two regional committees that were formed during the RFD phase of the AEP. It is planned that these same individuals will serve as members of the two management committees for the project. In West Africa, the committee will be composed of the Principal Secretary of the Ministry of Education of Ghana; the Chief Secretary of the Department of Education of Liberia; the Permanent Secretary of the Ministry of Education of Sierra Leone; the Director of the Institute of Education, Cape Coast, Ghana; the Chairman of the Faculty of Education, University of Liberia; the Director of the Institute of Education, Freetown, Sierra Leone; Dr. Awadag Williams of the University of Sierra Leone at Fours Bay; Dr. Abbir Jackson, from the College of Science and Technology of Kumasi, Ghana. In addition, Professor W. T. Martin of M.I.T. and Mr. Hugh P. Bradley of EDC belong to both committees for East and West Africa.

The East African Committee has consisted of the Assistant Minister for Programs, Planning and Research of the Ethiopian Ministry of Education, the Assistant Minister's nominee from the Teacher Education Division of the Ethiopian Ministry of Education, the Permanent Secretary, of the Kenyan Ministry of Education, the Secretary of the Kenya Institute of Education, Ministry of Education, the Permanent Secretary of the Tanzanian Ministry of Education; the Director of the Tanzanian Institute of Education which is university affiliated, Ato Polczat Dilnescha, Professor of Mathematics, from Haile Selassie I University, and Professor J. E. Pnythian, Professor of Mathematics, from the University College, Dar es Salaam.

C. STRATEGY

Among the many problems confronting African education today is the great disparity between student enrollment in liberal arts and humanities courses as compared with mathematics and science courses both at the secondary and university levels. Even making allowances for the low percentage of students electing mathematics and science in the developed countries, the percentage of students electing science and mathematics is much lower in most African countries. The reasons for this are to be found in inadequately prepared teachers, old-fashioned methods, non-local examples, adding up to inadequate student preparation and a much greater risk of failure on graduation from secondary school and on university entrance examinations. The net effect of this is overproduction in the humanities and in increasingly critical shortage of technical and science-trained personnel.

It is AID policy to strengthen educational institutions, particularly in technical and scientific fields, to promote the training of modern-day technicians. In the final analysis, economic development will depend upon the ability of the new leadership to mobilize and use effectively resources necessary to face and overcome the problems of underdevelopment. The availability of technical manpower will, to an important degree, determine the time phase of such economic development.

In order to alter the imbalance of liberal arts over scientific curricula, improve the teaching of mathematics and upgrade the quality of mathematics teachers, four alternatives present themselves:

1. The African teachers could be sent abroad for additional training.
2. The teachers could obtain training in Africa with American institutions operating on the continent which have acquired considerable experience in this area.
 - a) The American Institute of Research has been operating in Nigeria since 1960.
 - b) The Columbia University Teachers' College has been implementing a regional project of Teacher Education in East Africa.
 - c) The Education Development Center has been conducting the African Mathematics and Science Program since 1962.

The first alternative is expensive and has been the cause of a serious "brain drain." It is in contradiction with current AID policy which requires the training of Africans in Africa whenever possible.

The American Institute of Research has been quite successful in its activity with the federal and regional ministries of education in Nigeria, as well as with the West African Examinations Council in operating programs of aptitude testing for education ministries, universities and industrial

and commercial organizations. AIR has also developed twenty-one standardized tests for Nigerian use and other parts of West Africa, but its experience is more concentrated on testing research rather than teacher training and curriculum development.

The third alternative is the Columbia University Teachers' College which has been active in East Africa in a teacher education project. Under that project (TEEA), Teachers' College furnished tutors in primary and secondary teacher training colleges. The major emphasis of that project is to supply teachers and the subjects are more related to education per se, including pedagogy, psychology and related courses. Teachers' College has used EDC material in curriculum reform and adaptation of school texts but has not emphasized mathematics or science in particular.

The fourth alternative, the Education Development Center is the one recommended over the other three.

Under an A.I.D.-financed contract, the Education Development Center has been engaged in research and development of mathematics curriculum reform, the development of didactic materials and the training of teachers, both in-service and pre-service.

Now that the research and development phase has been successfully concluded, it is not only logical but necessary to enter the implementation phase in order not to lose the momentum gained during the early stage. The regional mechanisms which have been established as a result of the R&D phase, including the East and West African Regional Councils on Education, must be strengthened. Halting our assistance at the present stage of evolution would entail a tremendous waste of investment, resources, time and effort that have already been put into the program.

This PROOP, therefore, proposes that EDC continue the work it has begun by the implementation of a five-year African Mathematics Program. At the end of that period, the Africanization of the program will have been completed. The cooperating countries will have completed the major elements of curriculum reform in primary and secondary school teaching of mathematics and will have developed the human and institutional resources to continue the on-going requirements for mathematics curriculum reform in the last two years of primary and secondary school without further external assistance.

D. PLANNED TARGETS, RESULTS AND OUTPUTS

The major objective of the African Mathematics Program is the training of approximately 400 African tutors and supervisors in the six participating countries. In East Africa, it is estimated that more than one hundred tutors and one hundred local supervisors will require in-service courses. Kenya and Tanzania are consolidating their teacher training organizations, some colleges are being increased in size and some upgraded in the quality of their staff and graduates.

In West Africa, it is estimated that nearly two hundred tutors 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.

The actual breakdown by region of the training objectives is as follows:

West Africa			East Africa		
<u>Country</u>	<u>Colleges</u>	<u>Tutors/ Supervisors</u>	<u>Country</u>	<u>Colleges</u>	<u>Tutors/ Supervisors</u>
Ghana	75	140	Ethiopia	5(+)	120
Sierra Leone	8(+)	34	Kenya	16(-)	40
Liberia	3	<u>26</u>	Tanzania	10(-)	<u>40</u>
	TOTAL	200		TOTAL	200

The signs represent consolidation (-) or planned increase (+) in the number of colleges.

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 provision of continuing assistance to college tutors as new courses are introduced.

During the annual leadership institutes, the mathematics educators will hold teacher seminars of approximately two weeks during which the mathematics teachers will be appraised of new teaching methods and materials. Following this leadership institute, the teachers will take a correspondence course, and the program mathematics educator will travel and visit each of the institute participants to help with any problem they may encounter in fitting the new methods into practice.

- (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.

In addition to the preparations of the syllabi, annual workshops will be held during which the adaptation of primary and secondary texts, as well as the basic concepts text will be undertaken. During the workshops, there will also be a preparation and a review of evaluation instruments of primary and secondary texts.

At the end of the program the following texts will have been completed:

1972 - Primary One and Two, Pupil and Teacher's Guide, Secondary One, Pupil and Teacher's Guide, Basic Concepts I

1973 - Primary Three, Pupil and Teacher's Guide, Secondary Two and Three, Teacher and Pupil Guide

1974 - Primary Four, Pupil and Teacher's Guide
Secondary Four, Pupil and Teacher's Guide

By the end of the project, the texts for the first four years of mathematics in the primary and the secondary level will be completed.

At this point, U.S. assistance will be completed. It is planned that the mathematics program will continue with local resources to revise and evaluate as well as complete the series at the last two years of the primary and secondary levels, that is primary Five and Six and Secondary Five and Six.

E. COURSE OF ACTION

Upon approval of this PROP, a PIO/T for \$200,000 will be issued, and a contract negotiated with the EDC.

By October 1970, one Mathematics Educator will be appointed for the East African Program and will be located at the Kenya Institute of Education; the two Mathematics Educators for the West African Program will also be appointed by that date and will be located, one at the Njala campus of the University of Sierra Leone and the other at the University College at Cape Coast in Ghana. The Mathematics Educator in Sierra Leone will also be responsible for Liberia.

By October 1971, a second Mathematics Educator will be appointed for the East African Program and will be attached to the Ethiopian Ministry of Education in Addis Ababa. His presence will be necessary to assist in visiting colleges and supervising correspondence courses, and undertaking rewriting and editorial work in connection with the preparation of the revised basic concepts text.

The outline of the duties and responsibilities of the Mathematics Educators is:

(a) The mathematical re-education of college tutors would be the main task of the mathematics 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 become familiar with 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 cooperation 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 Examinations Council undertake work in testing or audio-visual aids.

The ministries will release the tutors to attend the courses, which will 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 and West African Examinations Councils.

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

A writing workshop will be organized which would not only outline the syllabi but also begin the preparation of a text to assist the tutors to introduce the new syllabi. The workshop would undertake the following tasks:

(i) Prepare outlines of syllabi 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 re-writing would be required. The two mathematics educators in East and West Africa 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 1971.

Preparation and Publication of a Common Primary Text in West Africa

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.

Preparation and Publication of a Common Secondary Text in West Africa

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.

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.

Review of Secondary-School Mathematics

While the East African 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, at this stage, have shown preliminary interest in the long term objective of preparing a revised adapted text. All three 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.

During the first year of the program, a review will be made of papers on subsidiary mathematics which will have been submitted under the latest amendment of Contract AID/ccd-1557 (R & D phase of the program). The authors of these papers have been asked to identify the mathematical background needed by students of biology, chemistry, economics, etc., as they enter the university. This has been done so that a subsidiary mathematics course at A level can be prepared. At this stage, it is hoped that following this review a text based mainly on the Entebbe Mathematics A level course can be produced with additional exercises incorporated at relevant places by those who are competent in the specialized disciplines. In July 1971, a small group of ten people including five university representatives and five teachers will meet for two days to discuss the results of the initial review and to make plans for further action. It is possible that the text preparation can be done on a consultant basis during the following year, but a workshop may be necessary in 1972 to complete the work.

It is proposed to hold a two-week meeting in 1971 to review experiences in the use of the experimental texts, to consider what changes are considered desirable and decide whether a common text

can be published for Ethiopia and Tanzania. Participants at this meeting, would be one university mathematician from each country, one mathematics inspector from each country, one representative from each Institute of Education and six school teachers.

The two-day subsidiary mathematics meeting proposed for 1971 would coincide with this longer workshop. It is hoped that by meeting in the same place at the same time, the university/school ties will become closer and that the longer workshop may benefit by the presence of the extra people who are accustomed to work in other disciplines and at a higher school level.

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.

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 many 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.

In 1973 six African participants will participate in a special six-month program organized by the West African Examinations Council in Lagos. The program will be designed to develop evaluation skills.

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 expenditure involved.

It is, therefore, planned that materials developed by the project will be published by one of the facilities described below. The countries will finance the publication of the texts by the publishing center and will distribute the books within their school system.

Over the life of the project, it is anticipated that approximately 30,000 teacher training text books will be produced or about 6,000 every two years for the West and East African programs respectively. At an average cost of \$0.70 per copy, this represents about \$21,000 for the six countries.

For the production of the primary mathematics texts in West Africa, publication of Primary One will not be until the third year of the program. An estimated 100,000 copies will be published annually at an estimated price of \$70,000. Primary Two will require about 10% less or 90,000 copies at a price estimated around \$63,000. The production of the secondary text may not take place until the fourth year of the project. An estimated 10,000 copies will be required to satisfy the needs of the three cooperating countries.

It is planned to utilize the textbook production facility in Addis Ababa which is equipped with modern machinery and high-speed presses and has received assistance from UNESCO and Norway.

That center has the capacity to meet any demand in the field of school texts and since Ethiopia is one of the participating countries in the program, the choice of that center is a logical one. Since the center is receiving financial assistance, such as paper from Norway, technical assistance from UNESCO, it is able to produce large volume publications at lower rates than conventional commercial publishing houses can. Thus, if the costs are reduced as expected, the countries would be able to absorb these expenditures arising from the publication and distribution of the texts prepared at the workshops.

Another printing facility has been developed by UNESCO in Yaounde, Cameroon. That Center is producing material essentially for Cameroon, and present plans are to relocate it in another part of the city. This will result in reduced effectiveness for a period which may be as long as two years. Once the Textbook Center in Yaounde is permanently established and will have installed the A.I.D.-financed equipment, it could serve as a production center for West African mathematics textbooks.

Continuing Research

The tutor education program and the proposed publications will not provide a 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 cooperate 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.

Approximately \$16,000 are earmarked for the evaluation phase of the project.

Other Donors

Although there is no direct participation in the project planned for other donors, activities of a complementary nature are being undertaken by a number of donor countries and organizations.

The United Kingdom through the Overseas Development Ministry and the British Council provides teachers and advisors and supports general primary and secondary teacher education programs. They provide advisors in most ministries of education in the Anglophone countries of Africa. They also provide substantial numbers of teachers, some of whom teach mathematics.

UNESCO is providing a mathematics teacher on its team in the Kenya Science College in Nairobi. In Liberia, they have provided assistance in general curriculum development and in both Yaounde and Addis Ababa have been largely responsible for establishing the textbooks printing facilities.

The Canadians are assisting in the establishment of a radio/correspondence course to upgrade teachers. Norway and Canada have provided and are continuing to assist textbook printing in East and West Africa with grants of paper. Australia is providing a mathematics advisor to the Ministry of Education in Ghana. The I.B.R.D. is providing an education loan to Sierra Leone which provides assistance for general curriculum development.

The Peace Corps also has volunteers teaching mathematics in Kenya, Ethiopia and Liberia.

It is most difficult to quantify the extent of the complementary other donor assistance; but on the conservative side, it is estimated that it will total \$500,000 each year for the period 1970-75.

PROPOSED BUDGET

A) FY 71

<u>ITEMS</u>	<u>EAST</u>	<u>WEST</u>	<u>TOTAL</u>
1) Teacher Training Institutes	14,000	11,000	25,000
2) Correspondence Courses	4,000	4,500	8,500
3) Math Educators	19,500	39,000	58,500
4) Program Direction	24,000	38,500	62,500
5) Management Committee	5,000	4,500	9,500
6) Equipment and Supplies	2,000	3,500	5,500
7) Indirect costs and fees	11,000	19,500	30,500
TOTAL	<u>79,500</u>	<u>120,500</u>	<u>200,000</u>

B) FY 72 through 75

1) Teacher Training Institutes	<u>TOTAL</u> \$84,000
2) Correspondence Courses	33,000
3) Workshops	300,000
4) Evaluation	16,000
5) Mathematics Educators and Editors	720,000
6) Program Direction	174,000
7) Management Committee	37,000
8) Equipment and Supplies	15,000
9) Indirect Costs and Fees	<u>121,000</u>
TOTAL	1,500,000

NONCAPITAL PROJECT FUNDING (OBLIGATIONS IN \$000)

Table 1
Page 1 of 2

COUNTRY: REGIONAL

Project Title: AFRICAN MATHEMATICS PROGRAM

PROP DATE
Original
Rev. No.
Project No.

Mo/Day/Yr
6/18/70

698-11-690-356

Fiscal Years	Ap	L/G	Total	Cont ^{1/}	Personnel Serv.			Participants		Commodities		Other Costs	
					AID	PASA	CONT	U. S. Agencies	CONT	Dir U. S. Ag	CONT	Dir & U. S. Ag	CONT
Prior through Act. FY <u>70</u>		G	200	200			104				20		76
Oper. FY <u>71</u>		G	364	364			194				20		150
Budg. FY <u>72</u>		G	382	382			212				20		150
B + 1 FY <u>73</u>		G	387	387			200	12			20		155
B + 2 FY <u>74</u>		G	367	367			200				15		152
B + 3 FY <u>---</u>													
All Subs. <u>---</u>													
Total Life			1,700	1,700			910	12			95		683

1/ Memorandum (nonadd) column

Note that format of this page is same as E-1a.

If a second page of table is used, space year-line entries on second page at same location as on first page.

PROJECT AUTHORIZATION

1. PROJECT NUMBER 693-11-690-356	3. COUNTRY AFRICA REGIONAL	4. AUTHORIZATION NUMBER 0089
2. PROJECT TITLE AFRICAN MATHEMATICS PROGRAM		5. AUTHORIZATION DATE June 19, 1970
		6. PROP DATED June 17, 1970

7. LINE OF PROJECT

a. Number of Years of Funding: 5
Starting FY 1970; Terminal FY 1974

b. Estimated Duration of Physical Work
After Last Year of Funding (in Months): 12

FUNDING BY FISCAL YEAR (in U.S. \$ or \$ equivalent)	DOLLARS		P.L. 480 CCC + FREIGHT	LOCAL CURRENCY Exchange Rate: \$1 =			
	GRANT	LOAN		U.S. OWNED		HOST COUNTRY	
				GRANT	LOAN	JOINTLY PROGRAMMED	OTHER
Prior through Actual FY 70	200						
Operational FY 71	364						
Budget FY 72	382						
B + 1 FY 73	337						
B + 2 FY 74	367						
B + 3 FY							
All Subsequent FY's							
TOTAL	1.700						

9. DESCRIBE SPECIAL FUNDING CONDITIONS OR RECOMMENDATIONS FOR IMPLEMENTATION, AND LIST KINDS AND QUANTITIES OF ANY P.L. 480 COMMODITIES

None

10. CONDITIONS OF APPROVAL OF PROJECT

This project is approved subject to a PROP revision after a few months of project operation, and prior to the obligation of any FY 71 funds.

(Use continuation sheet if necessary)

11. Approved in substance for the life of the project as described in the PROP, subject to the conditions cited in Block 10 above, and the availability of funds. Detailed planning with cooperating country and drafting of implementation documents is authorized.

This authorization is contingent upon timely completion of the self-help and other conditions listed in the PROP or attached thereto.

This authorization will be reviewed at such time as the objectives, scope and nature of the project and/or the magnitudes and scheduling of any inputs or outputs deviate so significantly from the project as originally authorized as to warrant submission of a new or revised PROP.

A.I.D. APPROVAL	CLEARANCES	DATE
Dr. Samuel C. Adams, Jr. SIGNATURE	AFR/TAC, M. Belcher	
	AFR/DP, E. B. Hogan	6/19/70
	A/DAA/AFR, D. Shear	6/19/70
	A/CONT	
AA/AFR		
TITLE	DATE	

TO : AA/AFR, Dr. Samuel C. Adams, Jr.
THRU : AFR/DP, Mr. Edward B. Hogan, Acting
FROM : AFR/TAC, Marjorie S. Belcher *MSB*
SUBJECT: Request for Life-of-Project Authorization: African
Mathematics Program, 698-11-690-536, Africa Regional

The regional African Mathematics Program will promote mathematics curriculum reform and new approaches to teaching mathematics in six English-speaking countries in East and West Africa. This will be accomplished through in-service and pre-service training of approximately 400 mathematics teachers, teacher trainers and local school supervisors. The project will entail the development of revised curriculum and related pedagogic materials. The program will be carried out at the same time in Ethiopia, Kenya, Tanzania, Sierra Leone, Liberia and Ghana. It will begin in July 1970 and be completed five years later. The life-of-project cost is estimated to be \$1,700,000. These data are consistent with the information provided in the FY 71 Congressional Presentation without any exceptions.

The PROP has been reviewed and cleared by the three geographic offices concerned as well as by TA/EHR. Some problems were raised on the need to sharpen the focus of the project proposal particularly pertaining to the African participation, the self-evaluation elements in the project and the human and institutional relationships that should be developed by the project.

The matter was resolved by agreement that a PROP revision will be prepared within the next few months and prior to the provision of any FY 71 funds for the project.

We recommend that you sign the attached Project Authorization.

Attachment: Project Authorization

Non-Capital Project Paper (PROP)

Country: Africa Regional

Project No. 698-11-690-356

Submission Date: June 17, 1970

Amendment: March 30, 1971

Project Title: African Mathematics Program

U.S. Obligation Span = FY 1970 through FY 1974

Physical Implementation Span = FY 1971 through FY 1975

Gross life of project financial requirements:

U.S. Dollars

\$1,737,000

Cooperating country cash contributions = See text for in kind contributions of cooperating countries

Other donors = See text for description of complementary activities of other donors

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AFRICAN MATHEMATICS PROGRAM (PROP)

PREFACE

This is a revision of the African Mathematics Program PROP approved June 19, 1970.

A. Summary:

The overall goal of this project is based on a two fold rationale. First, for the majority of children who will not continue beyond primary school, modern mathematics is designed to provide them not only with computational skills and a general body of mathematical knowledge, but also through its use of the inductive learning approach, an ability to reason and solve problems in a logical, rational way that will aid them in all aspects of daily living in a developing, modernizing society, including the transfer of inductive approaches to other subjects of the school curriculum. Secondly, for those who continue their education beyond the primary school, this project will provide the basic grounding in the fundamental of mathematics to enable students to move into advanced study of mathematics at secondary and higher levels. These people will eventually become the technicians and scientists so critically needed for development but which are currently in such short supply.

Therefore, the purpose of this project is to improve the teaching of mathematics in five African countries. Regional

activities will be initiated simultaneously in Ghana, Liberia, Sierra Leone, Ethiopia and Kenya to assist these countries to enter into the implementation phase of the work of school mathematics curriculum reform. The earlier research and development phase of the African Mathematics Program,^{1/} initiated through a contract with the Education Development Center (EDC), concentrated on the development of the Entebbe Mathematics Series and training of sufficient teachers in their use to test the validity of the use of modern mathematics in the African schools. This has now been accomplished.

The implementation phase concentrates on improving the teaching of primary school mathematics, primarily but not exclusively, through the development of materials for the primary teacher training colleges and the training of the college mathematics tutors in their use. No major effort is envisaged at the secondary school level since at the present time most secondary school mathematics teachers are expatriates and for the most part they have access to imported modern mathematics materials. However, to the extent mathematics at the secondary level can be assisted; i.e., gradual development of indigenous materials and training of African teachers as needed and requested, this project will assist.

^{1/} Centrally funded research project. (AID/csd-711). Supported also by the Ford Foundation and by the Louis and Pauline Cowan Foundation, Inc.

During the five-year span of this project the following objectives for participating countries will be met:

- ✓ (1) All training colleges will be staffed and will have available materials and will offer courses in mathematics so that all teachers trained at these colleges can cope with the curriculum changes in primary school mathematics which are being implemented;
- (2) Each country will have available a person trained and experienced in the evaluation of the reformed curriculum materials and in the new teaching practices related to the use of these materials;
- (3) School supervisors (District Education Officers) will have been given a suitable mathematical background to enable them to assist in mathematical in-service courses to prepare teachers to introduce the new mathematics courses into the schools and to guide and help the teachers during their visits to the schools;
- (4) In the Western African Region, suitable primary texts and to some extent secondary materials will be available at acceptable prices. (In the Eastern Region because of language differences at primary level a common regional primary text is not possible. Each participating country has decided to prepare its own primary texts, outside the program.)

This project began in July 1970 and is scheduled for completion by the end of FY 1975 with a life-of-project cost estimated to be \$1,737,470.

B. Setting:

In 1962 A.I.D. started the research and development phase of the African Mathematics Program by signing a contract with the Education Development Center (EDC) for \$2.9 million to develop, in cooperation with African mathematicians and educators, new mathematics curriculum materials and to initiate training programs for African teachers. As a result, program workshops were held to prepare textbooks, which resulted in the development of sixty-six volumes of experimental primary and secondary mathematics textbooks and teaching guides. In addition, a battery of tests covering the work of several courses was prepared.

Countries using the new material have now acquired some experience in teaching modern mathematics, and it is felt that the time has come to examine the results of this experimental program. 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, to consider the production of a revised 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 texts and adapting the School Mathematics Project materials.

There is a need throughout Africa for a new mathematics text to cover the A level subsidiary mathematics course (post secondary university preparation). This is a course taken by students who do not intend to continue their study of mathematics further but must be equipped to use mathematics in their areas of specification. A common core of mathematics could be identified for a course which would satisfy most needs.

Early in the program, it became clear that it wasn't enough just to write new texts but that it was also necessary to introduce teachers, presently in the schools to the new pedagogical approaches written into the texts and to train them to use the new texts. Thus far a total of 75 in-country institutes have been held. The African Mathematics Program has provided a total of 47 lecturers for these courses. Some 5,000 teachers and teacher educators have been introduced to these materials at institutes. The children in nearly 45,000 classes in ten African countries are being taught this modern approach to mathematics. Additionally, 2,000 teacher training classes are being instructed in the modern math approaches.

In addition to the in-country institutes described above, the ABC Program, which operated for three summers beginning in July 1966 at University College, Nairobi, Kenya, has concerned

itself with the mathematical education of the senior mathematics tutors of 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 can then, in turn, be able to give suitable training to the teachers in the schools or to those about to enter the schools.

But the teachers are not the only personnel of importance in affecting a new program. Local school supervisory personnel in many of the countries also carry major responsibility for bringing about curriculum change. 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 government ministry, the colleges and the teachers. The success of any program for implementation of curriculum reform in mathematics will depend heavily on the ability of supervisors. In many ways their work is similar to that of training college tutors, and similar courses are necessary for them.

In concluding the Setting portion of the PROP, one more point should be made: The education of personnel and the preparation of publications will not provide a 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. Necessary aspects of any regional program in mathematics must be the development of a research capacity to evaluate existing programs as well as the demonstration of a constant concern for the development of a mathematics education which is flexible and which will respond to the changing needs of such developing countries.

C. Project Purpose/Strategy:

As stated previously in the summary, this phase of the African Mathematics Program seeks over a five-year period to develop a core of mathematical knowledge, skills and attitudes for primary school leavers to use in their everyday lives and to provide a base for advanced studies for those continuing into secondary and higher education, who will eventually become the technicians and scientists so critically needed in the developing African nations. This will be implemented in five English-speaking countries in East and West Africa by (1) developing and promoting new mathematics curriculum materials and approaches ^{primary} in/schools, ^{primary} secondary schools, and/teacher training schools, (2) training approximately 350 college mathematics tutors and local school supervisors, and (3) establishing a competent cadre

of people capable of evaluating the training and material production undertaken as well as providing for the on-going work of research and reform which the program will encourage.

This program will be carried out simultaneously in Ethiopia, Kenya, Sierra Leone, Liberia and Ghana. Ministry of Education officials and mathematics educators from these countries explicitly stated at meetings held in Accra in August 1969 and in Nairobi in August and December 1969 that it was their intention to introduce modern mathematics curricula into their schools as soon as possible. At these meetings they requested assistance in implementing reform programs. These requests were appropriate because the research and development phase of the African Mathematics Program was successfully completed in June 1970, and in order to realize the maximum benefits from this phase of the program, it was not only logical but necessary to enter the implementation phase in order not to lose the momentum gained during the early state. The regional mechanisms which have been established as a result of the R&D phase, including the East and West African Mathematics Management Committees, must be strengthened. Halting our assistance at the present stage of evolution would entail a tremendous waste of investment, resources, time and effort that have already been put into the program.

In the final analysis, economic development will depend upon the ability of the new leadership to mobilize and use effectively resources necessary to face and overcome the problems

of underdevelopment. The availability of trained manpower both at the primary and secondary school graduate levels will, to an important degree, determine the time phase of such economic development.

This PROP, therefore, propose that EDC continue the implementation of a five-year African Mathematics Program. At the end of that period, the Africanization of the program will have been completed. The cooperating countries will have completed the major elements of curriculum reform in primary school teaching of mathematics and will have developed the human and institutional resources to continue the on-going requirements for mathematics curriculum reform without further external assistance.

The availability of manpower to undertake these tasks was considered. In the five 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 Project, its workshops and especially participation in its ABC Institute, the work done in connection with the East African School Mathematics Project, 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. 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 seminars leaders in institutes or as participants in writing workshops. Foreign technical assistance will therefore be necessary to initiate actions along the suggested lines.

U.S. assistance will include four mathematics educators (one of whom will also have editing responsibilities for East Africa) who will assist in running the leadership courses and workshops and preparing and supervising correspondence course.

Once the tutors and supervisors have been trained, they will be able to permanently take over responsibility for the in-service and pre-service training of primary school mathematics teachers. U.S. assistance will also include one full-time editor who will be employed to develop the materials which are written at/workshops into camera ready copy for the printers. Initially, this editor will be American (as are the educators) but hopefully, within two years the editing function will be taken over by Africans who will be trained for this purpose.

The first year of this project, oriented essentially toward implementation of the reforms, will carry forward some elements of the R&D phase, and introduce major new ones. It will be

particularly important to assure that the anticipated African program support at both the school and government ministry level is provided and that the African direction and management of the program develops along planned lines. The program which is proposed here not only will insure the maximum utilization of the experimental materials prepared in the R&D phase, but will further the work of mathematics curriculum reform and at the same time establish the human and institutional framework within which the reform work may continue after the five-year period. Regional funding for the project is proposed because the main problems arising from the implementation of mathematics reform are common to the five countries and can be solved through regional assistance.

D. Outputs/Activity Targets:

In line with the purpose of this project as stated above, the desired outputs may be grouped in terms of (1) trained personnel, (2) prepared instructional materials, and (3) established evaluation and research capabilities.

1. Training Personnel

(a) Teacher education, including the provision of material and teacher training, is the essence of this project. The thrust here will be to reach the teacher training college tutors and school supervisors who, in turn, will assume responsibility for the in-service and pre-service training

of their nations' primary school teachers. Approximately 360 primary teacher training college tutors and local primary school supervisors will be trained. A more exact figure is not available since some of the five countries are consolidating their education systems while others are expanding theirs. Following is an indication of the teachers and supervisors to be trained.

<u>West Africa</u>		<u>East Africa</u>	
Ghana	140	Ethiopia	120
Sieria Leone	34	Kenya	40
Liberia	26		
Total	<u>200</u>	Total	<u>160</u>

(b) In-service training for African secondary school teachers may be conducted when a need is identified for a sufficient number of persons to justify such training. This training might take the form of participation at summer workshops to write teachers' guides to the JSP secondary math texts.

2. Preparing Instructional Materials (at Summer Workshops)

East and West Africa

(a) A new syllabus and a suitable textbook adapted from Basic Concepts of the Entebbe Series will be prepared for introducing modern mathematics into primary teacher training colleges.

(b) The mathematic educators will prepare the correspondence courses which will link with the continuing training institutes for teacher training college tutors.

- c. The possible development of a subsidiary A level (post secondary) mathematics text will be explored.
- d. Films and audio aids such as tapes will be provided for use in both preservice and in-service teacher training ^{aids} courses.

West Africa

- ✓ (a) There will be the development and publication on a regional basis of a common core of material for the primary mathematics texts which will adapt and incorporate the material in the existing texts already used on an experimental basis with each country making certain country specific adaptations and which would be readily available at a reasonable price.
- (b) There will also be development of secondary school mathematics instructional materials, reflecting experience gained from the use of Entebbe and other texts. In addition to teachers' guides there may be some textbook development. The estimated timetable for materials development is as follows:

- 1972 - Primary One and Two Texts and Teachers' Guides, Secondary One Teacher's Guide.
- 1973 - Primary Three Text and Teacher's Guide, Secondary Two and Three Teachers' Guides.
- 1974 - Primary Four Text and Teacher's Guide, Secondary Four Teacher's Guide.

It is planned that the mathematics program will continue with local resources to revise and evaluate as well as complete the textbook series at the Primary Five and Six levels. ✓

East Africa

(a) Because of language differences at the primary level, a common regional primary text is not possible. Each participating country has decided to prepare its own primary texts, outside the program.

(b) A review of secondary mathematics experience may lead to the preparation of a revised adapted text.

Note: The bringing together of teachers at these summer workshops should be considered as an important training component of the project as well as a means to develop materials.

3. Establishing Evaluation and Research Capabilities

(a) Evaluation expertise will have been created which will permit on-going evaluation of mathematics teaching generally.

(b) A capacity will be developed within each participating country for a continuous activity of revision, testing and evaluation of modern primary mathematics materials.

With the achievement of these outputs, U.S. assistance will be completed.

E. Inputs and Course of Action

Total U.S. project inputs will amount to \$1,737,470 for which \$1,054,760 is for the West African Program and \$672,710 for the East African Program. The project will provide for personnel services, ~~equipment and supplies~~, for participant training and for other costs. Details of budget estimate will be found in Annex A.

Although no direct cash contributions on the part of the cooperating countries are planned, the host countries will provide the salaries and benefits to all the teachers participating in the program, as well as make their facilities available for project implementation. The host countries are also providing personnel from the ministries of education and the schools for the East and West African Mathematics Management Committees who, under EDC supervision, will manage the operations under this program. These Committees, which will be primarily African in composition, will gradually take over policy and executive responsibility for the programs. In addition, the countries' purchases of the printed textbooks, and their distribution through the respective school systems are direct contributions to the program.

No other donors are planning direct participation in the project, although a number of donor countries and organizations

are undertaking activities of a complementary nature. Among these donors are the United Kingdom, Canada, Norway, Australia, the U.S. Peace Corps, UNESCO and the I.B.R.D.

U.S. assistance will include four Mathematics educators. Three of them were appointed in October 1970 and are located as follows:

1. University College at Cape Coast in Ghana.
2. Njala Campus of the University of Sierra Leone. This man will also be responsible for Liberia.
3. Kenya Institute of Education

The fourth man will be appointed by October 1971 and will be attached to the Ethiopia Ministry of Education in Addis Ababa.

These men will be responsible for the following:

1. Conducting in-service institutes for tutors of teacher training colleges and district primary school supervisors lasting two or three weeks each. Attention will be given to both math content and methods of teaching.
2. Developing correspondence courses to be given to tutors and supervisors who participate in institutes.
3. Visiting teacher training colleges (at which time the district supervisors in the areas visited will come in to the colleges) ^a as follow up to the institutes and correspondence course work.

4. Assisting with summer workshops to produce local adaptations of the Entebbe materials.
5. Supervising the testing and editing of the materials developed in the workshops.
6. Assisting with an evaluation of their efforts at tutor and supervisor training under the direction of an evaluation consultant from the United States.
7. Maintaining close contact with the ministries, keeping them informed about plans and the development of the work, and responding 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 and West African Examinations Council.

Project Management

Initially, Education Development Center (EDC) will be manager of the program. However, a local administrator, an African, has been appointed for each region with responsibilities to make detailed arrangements for institutes and workshops, to assist in the control of the correspondence course and to plan visits to colleges and arrange travel schedules for the mathematics educators. During the early stages of his appointment the local

administrator will be assisted by EDC personnel in gaining experience so that within two years he will be able to take over the overall administration of the program and become its director.

During the first year of the program, it will be EDC's responsibility to investigate ways whereby the total control of the program, financial and administrative, can be handed over to a decision-making regional group composed of Africans with direct links to the respective ministries of education so that within two years EDC will cease to be program manager and will become a resource to the African regional groups. The possibility of moving under the umbrella of the East and West African Regional Councils of Education or under the Association for Teacher Education in Africa is already being explored.

Each local administrator will be appointed by the Mathematics Management Committee of his region. He will be the executive officer of the Committee and arrange for the implementation of its decisions and be responsible for the day-to-day administration of the program. He will report to the Management Committee and keep its members informed of the program's progress and activities. He will call for the assistance of local members of the Management Committee to further the program needs in specific countries if administrative or official problems arise.

This management will entail selection and approval of staff appointed, planning future activities and arranging for the preparation of proposals for continuing funding of the program. The Committees will be policy-deciding bodies and will act through their officer - the local administrator.

The Committee members from the ministries and institutes of education will hold their membership as representatives of their ministry or institute, rather than as individuals. Thus they will be considered as official spokesmen at the meetings. Even so, there may be occasions when decisions of the Management Committee may require further official approval from the ministries or the institutes.

The Management Committee will normally meet twice a year but will meet more often if the need should arise. At the first meeting of the Committee a chairman will be chosen. Initially EDC and the local administrator and later the local administrator alone will maintain close contact with the chairman who will be responsible for calling both regular and special meetings.

In-Service Training

In terms of training, of African personnel, the prime task of the program is the training of college tutors^{1/} to enable them to deal with the new curricula. They are the ones who eventually

1/ The target and course of action is to train 400 such college tutors through seminars and correspondence study for a total of 2 years for each instructor. This training will be conducted in Africa, utilizing funds identified as Participant Training. (item 7, Annex A).

will be responsible for turning out teachers versed in the new methods as well as preparing the staff for, or perhaps staffing themselves, the many in-service courses which will be needed each year to reach the teachers already in the schools.

Although most of the four mathematics educators are located at teaching institutions, they are not undertaking teaching loads in the normal university schedules. During the first year of the program, for example, in consultation with the respective ministries of education, they have been identifying teachers, tutors, and others who can assist in running the leadership training program and can contribute at the workshops. Prospective members of the proposed evaluation team are also being identified in the process with a final selection being made after judgments have been made based on their contributions at the first workshop. When the tutors and 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 policy and finances make possible.

Syllabi and Textbook Development

The workshops constitute a major aspect of the project since they will produce local adaptations of the required materials. U.S. assistance will be provided for one full-time editor and approximately half the time of one of the four math

educators who will also perform the functions of an editor. Each participating country is also expected to appoint its own editor trainee. These African editors, whose salaries will be paid by their own governments, will engage in an on-the-job training program in Ghana where under the supervision and with the assistance of the U.S. editors they will work with the materials which come from the workshops and will prepare the texts for publication, visit training colleges and schools, consult with tutors and teachers and collaborate closely with the mathematics educators. Toward the end of their training they will be sent to the United States for a study tour of U.S. printing facilities.

Among the planned workshops is one which will prepare a new syllabus and begin the preparation of a complementary textbook. This workshop will undertake the following tasks:

✓(1) Prepare outlines of syllabi which would introduce modern mathematics into the colleges and improve teaching approaches.

✓(2) Examine existing teacher training texts to identify items which could be adopted or adapted to satisfy the needs of the new syllabus.

(3) Undertake such adaptation or rewriting as is found necessary after the identification of needed topics. This task will be mainly one of selection and not much rewriting should be required. The two mathematics educators in East and West Africa 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 1971.

It is proposed that for West Africa a 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.

These same workshops may also work on the preparation of materials for the secondary schools. West Africa has adopted the Joint School Program (JSP) secondary mathematics texts. Most of the teachers, who are expatriates at this level, can handle this text but some of the African teachers would benefit from participating in the development of teachers' guides to the use of these texts. It is anticipated that the guides for one year of school can be completed each year.

The African countries have also expressed interest in developing a course and materials for a subsidiary A Level mathematics course for students in such fields as biology, chemistry and the social sciences.

During the first year of the program, a review will be made of papers on subsidiary mathematics which will have been submitted under the R&D phase of the program. The authors of these papers have been asked to identify the mathematical background needed by students of biology, economics, chemistry, etc., as they enter the university. This has been done so that a subsidiary mathematics course at level A can be prepared. At this stage, it is hoped that following this review a text based mainly on the Entebbe Mathematics A level course can be produced with additional exercises incorporated at relevant places by those who are competent in the specialized disciplines. In July 1971, a small group of ten people including five university representatives and five teachers will meet for two days to discuss the results of the initial review and to make plans for further action. It is possible that the text preparation can be done on a consultant basis during the following year, but a workshop may be necessary in 1972 to complete the work.

Publication of Material

EDC will assume responsibility for the publication of the textbooks developed under this project; i.e., they will prepare camera-ready copy for the printer and will assist the Math Management Committees in their selection of a printer (or printers) keeping in mind both printing costs and distribution problems. It should be noted, however, that the actual cost of printing and distributing the texts will be borne by the countries participating in the project.

Audio-Visual Aids

One of the mathematics educators will have a main responsibility in the area of audio-visual aids. 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 many 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.

Evaluation and Research

An American consultant on evaluation will visit the programs in Africa three times a year for approximately two weeks each visit to carry out an evaluation of the tutor and supervisor training planned under this project. This evaluation will include (1) a pre-test to be given to the participants at the training institutes (tutors and supervisors) to determine their mathematical content knowledge and their attitudes towards the teaching of mathematics, (2) a test after a year and (3) a final test at the end of two years to determine what changes have taken place.

As an integral component of this project, training will be provided for local personnel to enable them to undertake curriculum evaluation. This will consist of both training on the job and formal training at the University of Ibadan and with the West African Examinations Council.

The people selected for this training will be good secondary school teachers or well-qualified tutors from primary training colleges. Each country involved in the program will be invited to nominate one person to undergo training. It is hoped that at the end of the training, the evaluators will be competent to undertake evaluation of curriculum development in other subjects as well as mathematics. It is felt that a mathematics background is not essential.

The salaries of the trainees will be paid by their local government. The program will be responsible for all expenses

arising from activities in the program other than salary. It is anticipated that this will provide full time employment for the people concerned.

Training will be undertaken in two stages:

a. On the Job

1. The trainees will be involved in assisting the program's Consultant Evaluator in assessing the effects of the program on the behavior and attitudes of the training college tutors and district supervisors who attend the institutes and take part in the correspondence courses. For this part of the training, they will work in the training colleges under the supervision of the Consultant Evaluator doing pre-testing of program participants and intermediate testing and observation and final testing and observation. They will act as correspondents for the Consultant Evaluator and will work under his close direction.
2. They will also be involved in assessing the suitability of the preliminary materials which are produced at the workshops. This part of the training will be supervised by the mathematics educators and editors. The preliminary materials produced at the workshop will be given immediate trial use to test suitability in five primary classes in each country and in two or three training colleges in each country. The Trainee Evaluators

working under the direction of the Maths Editors and Maths Educators will keep close watch on the use of the materials and with the assistance of the teachers and pupils, will advise the program Editor on their suitability and make suggestions for improvement.

b. Formal Training

1. Within two years of entering the program, they will attend the University of Ibadan for one semester to work under Tunde Yoloje who is developing a course in evaluation.
2. They will attend courses of the West African Examinations Council to gain experience in developing and applying test items.
3. After attending these courses, they will continue their field work in their own country under the guidance of Dr. Yoloje.

Primary School Leaving Examinations.

Before the modern mathematics materials are adopted for widespread use in the primary schools of the countries participating in this project, it is anticipated that their Ministries of Education will revise the mathematics portion of their primary school leaving examinations to reflect the new emphasis. Ghana, the only country to date which has a first group of students who were engaged in the research phase of the project ready to complete their primary

school studies, has already revised their exam for these students. In any case it has already been demonstrated that students in the modern math program can also satisfactorily pass traditional math exams.

It is anticipated that as a result of the materials development workshops, the four to five years of experience primary school teachers will have had in using the new materials, the training of supervisors and teacher training college tutors, and the program evaluation activities, a continuous process of curriculum and materials development, testing and revision will be incorporated into the plans and operations of the ministries of education of the participating countries.

Drafted- AFR/DP, HGray
AFR/TAC, HFreeman:dph:3/2/71

Fiscal Years	Total	Contract	Personnel Serv.			Participants		Commodities		Other Costs	
			AID	PASA	CONT	U.S. Agency	Cont	Dir. U.S.	Cont.	Dir & U.S.	Cont.
Prior through Act. FY 70	192	192			102		-				90
Oper. FY 71	385	385			188 3/		23 1/				174 2/
Budg. FY 72	381	381			163 3/		30 1/				188 2/
B + 1 FY 73	390	390			164 3/		31 1/				195 2/
B + 2 FY 74	389	389			170 3/		15 1/				204 2/
Total Life	<u>1737</u>	<u>1737</u>			<u>787</u>		<u>99</u>				<u>851</u>

1/ Training within Africa.

2/ Includes \$41,000 per year for workshops to develop materials but which also an important training component of project.

3/ Includes, Home Office backstopping, Field Staff and Consultants for workshops and evaluation.

Annex A

Regional Mathematics Program (Contract No. afr - 711)

Line Item Budget (Article IV of Contract)

July 1, 1971 to June 30, 1975

	<u>FY 71</u>	<u>FY 72</u>	<u>FY 73</u>	<u>FY 74</u>
1. Salaries				
(a) U.S. Personnel	\$ 38,400	10,000	6,000	6,000
(b) Field Staff (Educators and Editor)	80,000	84,200	88,200	92,200
(c) Cooperating Country Personnel	14,400	25,000	26,000	27,000
2. Allowances	30,000	31,000	32,000	34,000
3. Consultants (Workshops and Evaluation)	22,560	22,340	22,340	22,340
4. Fringe Benefits	17,260	15,000	15,000	15,000
5. Overhead	43,280	37,000	36,000	36,000
6. Travel and Transportation (International and Local)	48,350	52,000	54,000	59,000
7. Participant Local Training (includes travel and subsistence)	22,560	30,000	31,000	15,000
8. Workshops (includes travel and subsistence)	41,160	41,460	44,460	46,460
9. Other Direct Costs	27,500	33,000	35,000	36,000
	<u>\$385,470</u>	<u>381,000</u>	<u>390,000</u>	<u>389,000</u>

Note: Timing of completed outputs outlined by heavy black boxes.

REGIONAL MATHEMATICS PROGRAM EAST AND WEST AFRICA

ACTIVITIES/OUTPUT RELATIONSHIPS ON A TIME SCALE

ACTIVITIES	OBJECTIVES	1970												1971												1972											
		Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March						
PERSONNEL TRAINING: TUTORS & SUPERVISORS	<p>400 to be trained in 5-year program:</p> <p>200 in first 2 years and 200 in second 2 years:</p> <p>Evenly divided in East & West</p>	Appointment of 3 educators & 2 local administrators	4 Training Institutes 2(E) & 2(W)	50 participants at each Institute	On-going Correspondence Course for Institute participants, Supervisors, and Maths Educators	Jan-Nov	Visits of Educators to Tutors & Supervisors	Jan-Nov	Continuing Training Institute: same participants	Dec/Jan	Continuing Correspondence Course: same participants	Jan-Nov	Visits of Educators to Tutors & Supervisors	Jan-Nov	Completion of Training - First batch (200): Presentation of certificate.	Dec/Jan	4 Training Institutes for second batch: 2E, 2W, 50 participants each Institute	Dec/Jan																			
		<p>Developing experience in use of trial material, report writing, observations, & interviews with Supervisors</p> <p>TRAINING PART OF MATERIAL PRODUCTION</p> <p>Workshop Participants: Avg. 35 Teacher Experiencers: 12 TTC,</p>																																			
PREPARATION OF INSTRUCTIONAL MATERIALS	<p>Teacher Training Texts: 2 volumes for East & West.</p> <p>Primary Texts: 6 or 7 volumes with Teachers' Guides.</p> <p>Secondary Texts: Student materials and/or Teachers' Guides. Estimated minimum of 8 volumes. Subsidiary Maths 6 or 7 pamphlets. All materials adaptations of existing texts.</p>	Preparation for Workshop:	a) Appointment of consultant	b) Selection of participants	c) Collection of tentative syllabus	d) Selection of site	e) Appointment program editors & evaluators	Feb-July	2 Workshops - 1 E & 1 W - participants prepare trial material: Teacher Ed. Vol. 1 (E & W); Primary Std. 1&2 with Teachers' Guides (W); Secondary Form 1 text and/or Teachers Guide (W). Subsidiary Math review.	July/Aug	Tryout of workshop materials: 6 TTC, 6 Primary classes and 3 secondary classes. Supervised by Program editors, evaluators, and trainee editors & evaluators, assisted by Maths Educators. Subsidiary Math pamphlets prepared.	Sept-June	2 Workshops: Review trials of materials 1st workshop. Prepare trial materials Vol.2 E & W, Primary 3&4 with Teachers' Guides (W), Secondary 1I Text and/or Teachers' Guide (W)	July/Aug	Completion camera Vol.1 Teacher Ed. Primary 1 & 2 (W) Secondary 1 (W) Subsidiary Math. p	Nov/Dec 1972	Tryout of 2nd work materials. Same as before. Supervise before.	Sept-June																			
DEVELOPMENT OF EVALUATION & EDITORIAL EXPERTISE	<p>Dependent on Ministry manpower needs: 1 Evaluator and 1 Editor from each country.</p>	Consultations w/Ministries regarding Trainee evaluation Editors	Mar-Jun	Appointment of 2 Program Editors, Consultant Evaluator and maximum of 5 Trainee Editors and 5 Trainee Evaluators (6W & 4E)	July	Training starts at Workshop	July/Aug	Trainee Editors assist completion of camera ready copy of 1st Workshop materials. Supervise classroom trials 2nd Workshop materials.	Sept-Jan	Trainee Evaluators attend 1 semester at Ibadan	Sept-Jan	Trainees supervise/report classroom trials of Workshop materials. Evaluators pretest & observe college tutors. Evaluation Entebbe Primary 3 or 4.	Sept-June	Trainee Evaluation of 1 consultant Evaluation	Ja																						

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RELATIONSHIPS ON A TIME SCALE IN MONTHS

1972												1973												1974												1975						
Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
Continuing Institute: Continuing Correspondence Course: same participants Jan-Nov												Completion of Training - first batch (200): Presentation of certificate. Dec/Jan												4 Training Institutes for second batch: 2E, 2W, 50 participants each Institute Dec/Jan												On-going Correspondence Course for Institute participants Jan-Nov						
Continuing Institute: Continuing Correspondence Course: same participants Jan-Nov												Completion of Training - second batch (200): Presentation of certificate Dec/Jan												Continuing Training Institute: same participants Dec/Jan												Continuing Correspondence Course: same participants Jan-Nov						
Visits of Educators to Tutors & Supervisors Jan-Nov												Visits of Educators to Tutors & Supervisors Dec/Jan												Visits of Educators to Tutors & Supervisors Jan-Nov												Visit of Educators to Tutors & Supervisors Jan-Nov						
TRAINING PART OF MATERIAL PRODUCTION												Workshop Participants: Avg. 35 Africans per workshop												Teacher Experimenters: 12 TIC, 18 Primary, 9 Secondary																		
Trial material, report views with Supervisors												2 Workshops: Review trials of materials 1st workshop. Prepare trial materials Vol.2 E & W, Primary 3&4 with Teachers' Guides (W), Secondary II Text and/or Teachers' Guide (W) July/Aug												Completion camera copy for Vol.1 Teacher Ed. (E&W) Primary 1 & 2 (W) Secondary 1 (W) Subsidiary Math. pamphlets Nov/Dec 1972												Tryout of 2nd workshop materials. Same trial classes as before. Sept-June						
Workshop materials: 6 Primary classes and 3 Secondary classes. Supervised by Editors, evaluators, and Tutors & evaluators, by Maths Educators. Substantive pamphlets prepared. Sept-June												2 Workshops: short meeting in E to review revised materials of 2nd workshop. Prepare trial materials for Primary 5&6(W) & Secondary 3 & 4 (W) & review W revisions of 2nd workshop. July/Aug												Completion camera copy for Vol.2 Teacher Ed. (E&W) Primary 3 & 4 (W) Secondary 2 (W) Nov/Dec 1973												Tryout of 3rd workshop materials (W): same classes & same supervision as before. Sept-June						
1 workshop (W) short meeting: review revised materials from 3rd workshop. July												Completion camera copy for Primary 5 & 6 (W) Secondary 3 & 4 (W) Nov/Dec 1974												Training Completed 5 Editors 5 Evaluators July						Continue working with Program Editors and Evaluators until all tasks completed. Aug-June												
Program Editors assist completion camera ready copy of 1st Workshop materials. Supervise class-trials 2nd Workshop materials. Sept-Jan												Trainee Evaluators attend 1 semester at Ibadan Sept-Jan												Trainee Editors pay experiential visit to U.S. Sept-Nov												Trainee Evaluators continue evaluation tasks under guidance of Ibadan staff & consultant Evaluator; college visitations & text book use Jan-June						
Supervise/report class-work of Workshop materials pretest & observe tutors. Evaluate Primary 3 or 4. June												Trainee Editors continue classroom observations and assisting Program Editors in production of finished materials. Dec-June												Trainee Evaluators continue classroom observations as before.																		

Duration of Appointments - Overseas Staff

In Quarter Years		OCT. 1970		1971				1972				1973				1974				1975		
LOCATION	TITLE	4th qtr	1st qtr	2nd qtr	3rd qtr	4th qtr	1st qtr	2nd qtr	3rd qtr	4th qtr	1st qtr	2nd qtr	3rd qtr	4th qtr	1st qtr	2nd qtr	3rd qtr	4th qtr	1st qtr	2nd qtr		
<u>WEST AFRICA</u>																						
GHANA	Math Educator	John Norris Two Year Contract								Two & a Quarter Year Contract												
	Editor				Roger Hartman* Two Year Contract								Second Two Year Contract									
SIERRA LEONE	Math Educator	Jack Alexander Two Year Contract								Two & a Quarter Year Contract												
<u>EAST AFRICA</u>																						
ETHIOPIA	Editor/ Educator				Roy Dubisch* Two Year Contract								Second Two Year Contract									
KENYA	Math Educator	John Fitzgerald Two Year Contract								Two & a Quarter Year Contract												

*Presently under consideration for appointment.

PROJECT AUTHORIZATION

1. PROJECT NUMBER 698-11-690-356	3. COUNTRY AFRICA REGIONAL	4. AUTH 0178
2. PROJECT TITLE AFRICAN MATHEMATICS PROGRAM		5. AUTHORIZATION DATE 4/26/71
7. LIFE OF PROJECT		6. PROP DATED Amendment: March 30, 1971
a. Number of Years of Funding: <u>5</u> Starting FY 19 <u>71</u> ; Terminal FY 19 <u>74</u>		b. Estimated Duration of Physical Work After Last Year of Funding (in Months): <u>12 months</u>

FUNDING BY FISCAL YEAR (in U.S. \$ or \$ equivalent)	DOLLARS		P.L. 480 CCC + FREIGHT	LOCAL CURRENCY			
	GRANT	LOAN		Exchange Rate: \$1 =		HOST COUNTRY	
				U.S. OWNED	GRANT	LOAN	JOINTLY PROGRAMMED
Prior through Actual FY 71	577						
Operational FY 72	381						
Budget FY 73	390						
B + 1 FY 74	389						
B + 2 FY							
B + 3 FY							
All Subsequent FY's							
TOTAL	1,737						

9. DESCRIBE SPECIAL FUNDING CONDITIONS OR RECOMMENDATIONS FOR IMPLEMENTATION, AND LIST KINDS AND QUANTITIES OF ANY P.L. 480 COMMODITIES

None

10. CONDITIONS OF APPROVAL OF PROJECT

Project approval is given only through FY 1972 pending an evaluation ~~to be made in FY 73 to determine if it is feasible to accomplish project objectives by final funding year other than FY 1973 and if the cost of the project warrants change or extension~~

in FY 71/2 to determine the future course of this project. The Evaluation Team should include appropriate African educators.

(Use continuation sheet if necessary)

11. Approved in substance for the life of the project as described in the PROP, subject to the conditions cited in Block 10 above, and the availability of funds. Detailed planning with cooperating country and drafting of implementation documents is authorized.

This authorization is contingent upon timely completion of the self-help and other conditions listed in the PROP or attached thereto.

This authorization will be reviewed at such time as the objectives, scope and nature of the project and/or the magnitudes and scheduling of any inputs or outputs deviate so significantly from the project as originally authorized as to warrant submission of a new or revised PROP.

A.I.D. APPROVAL	CLEARANCES	DATE
 SIGNATURE AA AFR, Samuel C. Adams, Jr.	AFR/TAC, MBelcher	4/1/71
	AFR/DP, DShear	4/20/71
	DAA/AFR, PBirnbaum	4/23/71
TITLE	A/CONT	