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A REPORT
ON THE CURRENT STATUS OF
THE SCIENCE EDUCATION PROGRAMME FOR AFRICA (SEPA),
THE EDUCATION DEVELOPMENT CENTER, INC.
AND
MATHEMATICS AND SCIENCE EDUCATION NEEDS IN AFRICA

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TABLE OF CONTENTS

I	INTRODUCTION	2
II	EXECUTIVE SUMMARY	4
III	FINDINGS	10
	A. MATH AND SCIENCE NEEDS	10
	B. PURPOSE OF SEPA	12
	C. THE EDUCATION DEVELOPMENT CENTER	20
	D. SEPA'S VIABILITY	23
	E. REVITALIZATION OR.....	29
IV	RECOMMENDATIONS	33
V	BIBLIOGRAPHY	36
	APPENDICES	
	1. E.D.C. BUDGET SHEET	38
	2. REPORT ON INTERVIEWS HELD	41
	3. PEOPLE INTERVIEWS	46
	4. COSTING OF RECOMMENDATIONS	49

. 2

I. INTRODUCTION

Purpose: Project Committee for the Teacher-Text-Technology Initiative proposed that A.I.D. develop a discrete area of activity in mathematics and science. It suggest that the way to do this was to reactivate a contractual arrangement with the Education Development Center, Inc. (EDC) which had provided support to Africa for the development of mathematics and science curricula and texts from 1962-1976, and for the development of the Science Education Programme for Africa (SEPA). This review, a step in the examination of that proposal, is an assessment of the history and current status of EDC of SEPA, and of the relationship between them. The assessment concludes with recommendations for AID's action.

Methodology

Interviews and reviews of pertinent materials form the backbone of the review. Materials reviewed included contractor's final grant reports, plus annual reports of SEPA and EDC. Selected papers, materials, and monographs developed by and about the various organizations and programs involved were also read. These materials and interviews with key people produced a list of additional people to be interviewed.

Key people identified initially for interviews included AID personnel familiar with the programs and institutions, staff of EDC, staff at the Carnegie and Ford Foundations as donors to SEPA and EDC, and Dr. Hubert Dyasi, the first Executive Secretary of SEPA. These interviews produced names of other people to talk with in the United States and in Africa. Most of the U.S.A. interviews were carried out in person, though a few had to be done by phone.

Based on the names generated and materials read, it was decided that interviews would be sought in Botswana, Ghana, The Gambia, Kenya, Liberia, Nigeria, Senegal, Sierra Leone, Tanzania, Uganda, and at least one additional Francophone country; probably the Cameroon or Togo. Because of logistical problems and opportunities, Tanzania was replced by Zimbabwe, and Cameroon and Togo were dropped. Because of difficulties encountered in Africa, Nigerian and The Gambia were not visited. The interviews in Africa were scheduled for John Hatch, consultnat, and Marcia Ellis, AFR/TR/EHR, and took place between October 26 and December 10, 1983.

Acknowledgements

The interviewers wish to express special thanks to all of those in Africa who gave of their time to prepare for and conduct the interviews, especially those who served as liaison in contacting others and arranging the interviewers' schedules. A great deal of appreciation is due the staff of the Education Development Center, Inc. for the time, materials and support provided the consultant on short notice and during a difficult time. Without time weaned from the very heavy schedule of Dr. Hubert Dyasi, many useful pieces of information and contacts would have been missed. The consultant is much indebted to Dr. Dyasi for all of his generous assistance. Finally, but most importantly, this report would not exist without a variety of support, helpful criticism, and typing provided by the staff of AFR/TR/EHR at AID.

II. EXECUTIVE SUMMARY

PURPOSE: The purpose of this report is to assess the status of the Science Education Programme for Africa (SEPA), the Education Development Center, Inc. (EDC), and the relationship between them; and in light of that assessment, to make recommendations to AID on funding SEPA and on the role that EDC might have in that funding. The Executive Summary presents an overview of the findings, which are fully delineated in the report.

A. INTRODUCTION

AID's Project Committee for the Teacher-Text-Technology Initiative a suggested inter-agency endeavor, proposed to the then Acting Assistant Administrator that AID's support be in the areas of mathematics and science education in Africa. These are historical areas of interest for AID and would involve institution building. Such support would involve contracting out that component of the Initiative to the Education Development Center, Inc. (EDC) by reactivating former contractual arrangements between AID and EDC. The original contracts provided support to Africa for the development of modern mathematics texts: the African Mathematics Project (\$5,191,870; 1961-1975), and for the development of new approaches to science curriculum and teaching: the African Primary Science Education Programme (\$3,636,082; 1964-1976). The development of the Science Education Programme for Africa (SEPA), a Pan-African organization with OAU Observer status, began with \$28,515 in the latter grant going to SEPA directly. Subsequent AID grants, 1977-1981, directly to SEPA amounted to \$1,155,741.

Before action could be taken on the proposal, an assessment of the current status of SEPA and EDC was needed. The assessment which follows results from interviews in eight African countries, with EDC, and with foundations and individuals associated with both SEPA and EDC. In addition, contractor's reports, AID evaluations, annual reports of SEPA and materials produced by EDC and SEPA were reviewed.

B. FINDINGS

The report examines the three levels of SEPA: the Secretariat; a legacy of programs, materials and people; and activities and commitments in many countries in Africa. SEPA's Secretariat is located in Accra, Ghana, as the Ghanaian government has offered SEPA space and assistance with staffing. The Secretariat had its own offices but today its records and activities are housed in rooms in the Ministry of Education and are under the custody of Ghana's delegates to SEPA's Representative Council. The Council, SEPA's governing board, last met in 1980, and the Executive Committee's last meeting was in 1982. There is a part-time

bookkeeper/business manager and occasional secretarial help. The Executive Director resigned in 1981 and the Director of Programmes has not worked there since the summer of 1983, and has salary in arrears to May, 1982.

Poor financial management resulted in SEPA's current debt of \$217,893.33. Half, \$110,045.29, is owed to Ethiopian airlines, the remainder to staff for unpaid salaries, benefits and increments. SEPA maintains three accounts, all of which have had problems. The Accra account, for the annual dues of member states, supports the Secretariat. Six countries: Botswana, Ethiopia, Ghana, Liberia, Swaziland, Uganda, and Zambia have made payments for FY 1984. The Liberia account is for project monies; Liberia's dollar base made the transfer of these funds easier. The third account exists to provide quick access to funds needed in eastern and southern Africa, and consists solely of Kenya's dues. How dues are established, the status of payments, and mismanagement problems of the accounts are discussed in the report. As the Secretariat is effectively not operating, there are neither ongoing programs nor proposals to be funded.

SEPA's role in developing postgraduate training for science education trainers and in evaluation methodology are discussed. The two institutions involved are structural legacies of SEPA, their products represent the human resource development aspect of SEPA which is the source of SEPA's strength. They are strong supporters of the SEPA approach and are among the most sought after people in science education and teacher training. Many identify themselves as SEPA people (or SEPALings) even when not recruited through SEPA. It is through SEPA trained people, and materials developed during their training, that the concepts of SEPA are transmitted, even though the name SEPA may not be attached or the organization explained.

The SEPA concepts, espoused and incorporated in materials developed, remain the major outreach of SEPA. Though the fifty-four APSP Primary science units and the Handbook for Teachers are out of print, both are considered as valuable resource tools and reprints are frequently requested. The Source Book for Science Education has been revised, and just reprinted. The Child in African Environment, printed and distributed by UNEP, was the outgrowth of work in African children's concept development and a series of workshops in both Anglophone and Francophone Africa on environmental education. Materials from the workshops have been compiled into an Environmental Education source book which awaits funding for printing and distribution. These and other prototype materials espouse SEPA's concepts of discovery and participation in science education and curriculum, development and are adopted/adapted/built upon to fit the needs and circumstances of individual countries or programs.

The members of SEPA are: Botswana, Ethiopia, Ghana, The Gambia, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Swaziland, Tanzania, and Zambia. Four associate members are: Ivory Coast, Lesotho, Mauritius, and Cameroon, and others are interested in membership. Six were visited for the review; a seventh, Nigeria, would not allow the interviewer in. A summary of the findings on their recent relationships with SEPA included:

- o Botswana: Dues paid in 1980; hosted the Twenty Year Review of Science Education in Africa conference and an in-service workshop in environmental education; has ICBE and SETC trained educators; found SEPA useful for access to resource people for in-service training and materials development workshops, and for identification of donor agencies.
- o Ghana: Provides office space, resource people, and diplomatic assistance with the recovery of funds; APSP/SEPA materials used throughout Primary school system and Teacher Training Colleges; educational leaders sent to both SETC and ICBE, impacting on the Science Coordinators Training Programs; recently offered 300 copies of new curriculum for SEPA trials.
- o Kenya: Home of Chairman of SEPA; Kenya Institute for Education has incorporated the APSP/SEPA Science Curriculum Development Centre; ICBE and SETC grads employed in key positions had leadership roles in the Strategies for National Teacher Education Programs Conference in 1980; SEPA materials used in primary school and teaching training systems; SEPA resource people used in curriculum and materials development workshops and in-service training courses; and dues are a line item in the government's budget.
- o Liberia: Dues paid for FY 1983; hosted workshop on dissemination of SEPA materials; uses SEPA materials at the university.
- o Sierra Leone: SETC provides constant stream of materials for class and curriculum; many SEPA resource people; edited and printed revised Source Book for Science; and dues are budget line item.
- o Uganda: Dues paid; used SETC and ICBE scholarships; recently offered site for SETC with math and agricultural education components.
- o Tanzania: (not visited; representative interviewed) Materials translated into Kiswahili and used; SETC scholarship and participation in workshops elsewhere.
- o Zimbabwe: (non-member) SEPA materials were used in the development of the secondary Zim Sci program, as were SEPA resource people.

A dozen basic issues about SEPA were raised by the interviewees:

- Need for better accountability;
- Need for an executive who is a science educator and administrator;
- Infrequent Executive Committee meetings;
- Poor communications;
- A question of whether regional offices were needed;
- The expense of the Secretariat;
- The problems of foreign exchange;
- The location of the Secretariat;
- The possibility of crediting in-country expenses towards dues;
- The loss of donor support;
- The need for priorities and stated programs;
- Manpower development versus structures development

The perception gained from discussions of these and other issues was that if communications were improved, many of the other issues would not be as important. Questions of costs, time, manpower, and inconsistencies were not addressed but are discussed in the report. Consistent throughout, however, was the acceptance that SEPA was in trouble, that outside financial assistance was necessary and good, and that given time and financial support, SEPA could rebuild by itself.

While many countries felt that the Secretariat seemed expensive, they only made general suggestions: reduce the pay of the administrator, find a less costly way of governance than Council and Committee meetings, and perhaps regionalize or localize SEPA in each country. Countries felt that if SEPA had a more definite list of priorities and goals and it was clearer what, specifically, they would get for their dues, then the issues of expense, foreign exchange, and location would not be pressing. UNESCO's Network for Educational Innovations Development Assistance made an alternative suggestion that SEPA could be appropriately located in its soon to be established Science and Technology Network in Dakar thereby eventually eliminating any direct dues to SEPA. These issues and possible solutions are the kind that might be raised at the next SEPA meeting and are extensively covered in the report.

The needs list generated by the countries requires an organization like SEPA, with an established reputation for leadership and acceptance at the highest levels of government and in the minds of donor agencies and foundations, to be able to respond. SEPA was seen as a resource center for materials, information, and people available to respond to the science education needs of individual countries. SEPA is needed as a generator of funds and funding sources, and its awareness of innovative developments

would make it a logical developer of needed regional networks for curriculum and materials development. As an acknowledged leader, SEPA was seen meeting the need for educational leadership training, especially in decision making and management. And finally, SEPA could be an African voice in international science education and scientific research.

The most frequently mentioned need was for the development of science and mathematics curricula which were integrated, either together or separately, at the Primary and Junior Secondary/Middle School levels. The whole field of in-service workshops was frequently mentioned, especially for curriculum development and revision, and including textbook revision. New areas of need mentioned include: materials (and training) for environmental, rural, science and technology, and family life education; for out-of-school youth education; and for supplementary materials and readers at the Primary level. The suggested establishment of a publications and reproductions center at SEPA would help alleviate the backlog on governmental printing offices, produce materials, and generate income for sales and services rendered. In addition, the needed training and skills development in editing and book production could be met and an effective distribution network and process could be developed.

These and specific country needs are examined and costed out in the report, and it is clear that the costs can not be borne entirely by SEPA's membership. It was hoped that with AID's money and guidance, perhaps through EDC, SEPA could be revitalized and begin meeting the needs. EDC has maintained informal ties with SEPA and SEPA trained people through correspondence and visits since its responsibilities for SEPA ended in 1976, and more formally, through occasional editing of SEPA documents. EDC is still warmly regarded in Africa. The report explores EDC's current contractual arrangements and performances in the international sphere, its domestic programs, general fiscal health, and staffing capabilities, and finds it an appropriate and interested institution for assisting SEPA.

C. CONCLUSION:

While SEPA has made important contributions to materials development and training in modern approaches to science education in Africa, because of poor financial management it has been unable to continue its work. The vacuum left in leadership and services has not been filled. Countries have new needs in science and mathematics and are hopeful of finding a way to revitalize SEPA so that those needs can be met. Because of AID's historical support of SEPA and of mathematics education in Africa, and its current policy priority to development institutions, AID can appropriately play a significant role in African educational development by supporting the revitalization of SEPA. With a grant from AID, EDC helped start SEPA and has

remained in contact with many of those SEPA has trained. EDC is warmly respected in Africa and has the capability to develop institutions. EDC would be the appropriate organization for AID to use in assisting SEPA with its revitalization.

D. RECOMMENDATIONS

Specific recommendations, their alternatives and costs will be spelled out, but the highlights are:

- o That AID should support SEPA's revitalization;
- o That AID's support initially should be through an organization which would advise and support SEPA in the revitalization process;
- o That AID's support should be phased in as success is achieved at various levels of the revitalization process;
- o That, with certain constraints, EDC would be the appropriate organization to assist with the revitalization;
- o That AID give direct grants to SEPA; and
- o That, in SEPA member countries, USAID make bilateral grants in support of SEPA activities.

III. FINDINGS

The findings have been grouped into five areas:

- A. Math and Science Needs - as expressed by the interviewees
- B. Purpose of SEPA - which has been broken down into four areas: SEPA's history, including AMP and APSP; SEPA as leader; SEPA as implementor; and SEPA linkages.
- C. The Education Development Center - It's history and capabilities
- D. SEPA's viability, which includes a general overview as well as an examination of the governance and financial issues.
- E. Revitalization - including the need, processes and alterations.

Each area is summed in a brief conclusion.

A. MATH AND SCIENCE NEEDS

Twenty years after Independence, many Africa countries are re-evaluating their curricula. Though the African Mathematics Program (AMP) introduced modern mathematics to many Anglophone countries, others did not change the curriculum they inherited and some only made changes at one level but not at another. The Africa Primary Science Program (APSP) has had a significant impact on the focus and process of Anglophone Primary science education. The Francophone countries have, in general, not changed their science or mathematics curriculum. The evaluation takes place in the light of these developments and of current and expected manpower needs and pressures of having increasing numbers of school leavers educated, but not employable.

Mathematics has come under special scrutiny because it has always been an important and examinable subject and because many literate people are not numerate. Most countries are reverting to pre-modern mathematics for many of the same reasons that U.S.A. school systems have. Many countries are beginning to develop an integrated mathematics curricula at the Primary and/or Junior Secondary levels. Quite a few countries see mathematics as a tool of science and are looking for ways to integrate these two.

Science has frequently been a poor orphan in the Primary curriculum, but important as separate subjects in the secondary schools. This has led to both poor general concepts of science

and to weak enrollments (and offerings) at the secondary level. The importance of developing a scientific approach and a background for appreciation and conservation of the environment, better health and farming practices, better preparation for secondary school subjects and, ultimately, a more enlightened and employable citizenry in a technological age has led many countries to look anew at what and how science is being taught.

Integrated curriculum, Junior Secondary/Middle School curriculum, In-service, Applied Science and Research were five areas of special concern mentioned. Integrated curriculum included the need in science for a balance between concept development, discovery approach and application, and between concepts development, problem solving and applications in mathematics, as well as the integration of the two subjects. Materials and teacher training for the integrations are needed. The integrated curriculum would be at the Primary and Junior Secondary/Middle school levels, in part for employment or further schooling needs, and in part for improving the quality of education for women for whom little or good mathematics and science is offered.

In-service work for all levels of educational personnel in the fields of curriculum development and revision, materials development, textbook revision, and evaluation were asked for. Research in concept development and evaluation of programs were sought, and a network, or regional networks for the sharing of this information and of resources is needed. Finally, there was a need expressed for supplementary materials, curricula, source books and scientific equipment at all levels, and especially relevant to:

- . environmental and agricultural education
- . health education
- . out-of-school and rural education
- . education for science and technology

Country specific needs included: materials for untrained teachers (Botswana), training of university scientists as teacher trainers (Kenya), a Master of Science Education degree program (Ghana), staff and physical plant development for the Science Educator Training Course (Sierra Leone, Botswana), and the need for a science educator training course for Francophone countries.

Conclusion: African countries have many curriculum and materials development, in-service education and networking needs in mathematics and science education with which they seek help. Assistance with developing integrated mathematics and

science curricula at the Primary and Junior Secondary/Middle school levels is particularly needed.

B. PURPOSE OF SEPA

1. History of SEPA

The Science Education Programme for Africa (SEPA) resulted from a combination of the post-Sputnik curriculum development efforts in the United States and the educational needs of newly independent African countries. The reaction to Sputnik created intensive efforts to improve science and mathematics education. These efforts coincided with emergent African nationalism's desire for an education which would move its peoples quickly up to the West's level of preparation. A meeting of African and American educators in the summer of 1961 led later that year to the African Mathematics Program (AMP) and, in 1965, the African Primary Science Program (APSP). The Ford Foundation funded the preparatory meeting for APSP, but subsequent funds for that program and for AMP came from the Agency for International Development (AID). AID spent \$5,191,870 between 1961 and 1975 on the AMP, and \$3,636,082 between 1964 and 1976 on the APSP.

a) African Mathematics Program

Summer workshops of American experts and African mathematics educators working on texts produced twenty volumes of primary school materials, forty-two for secondary schools, four for teacher training institutes and four teacher guides by 1969. Five hundred thousand (500,000) volumes were published for general use; another million were produced in Ethiopia, Kenya and Tanzania, some being translated into Amharic and Kiswahili. The series led to other and competing series in modern mathematics being developed as the 200 page AMP volumes required six times the paper of the one it replaced, too great an expense for most countries. Fear about lack of success on various school-leaving exams and concerns about the usefulness of modern mathematics for Primary school students also inhibited its adoption.

Though 186 people from many countries and the U.S.A. were involved in producing the volumes, the project was led and controlled by the Americans. They were the experts; the Africans provided local examples, manpower and limited testing of the volumes before they were printed. The implementation stage provided only a weak framework for training of teachers and the process of adopting the materials to each country's need. There was a poor evaluation process and little training in curriculum development and no training of editors.

12

However, a series of 6-15 day short courses for teachers and tutors on modern mathematics and the AMP materials were offered in 1963-5.

In 1966-9 the Ford Foundation funded the ABC Institutes for senior level mathematics educators to start the implementation stage at the highest levels. They produced three films, eighteen audio tapes and a source book for each country's teacher training initiative. The East African Regional Mathematics Program (EARMP) Kenya and Ethiopia - and the West African Regional Mathematics Program--Ghana, Liberia and Sierra Leone--were established to initiate teacher educator training workshops in the AMP materials and modern mathematics. Approximately 410 people from 105 teacher training institutes participated in the eighteen month training courses. No plans had been established to provide for a Pan-African mathematics organization that would coordinate the adaptation of the training of teachers in the use of the AMP materials, so adaptation was left to individual countries. AID funds were not renewed at the end of the implementation grant and the AMP ended. Modern mathematics had been introduced at all levels to Anglophone Africa.

b) African Primary Science Program

The APSP developed separately from the African Mathematics Program. At the start it was agreed that the inquiry approach to learning should be stressed and that Science Centers should be developed as the base for curriculum development and in-service teacher training. Beginning in the summer of 1965, workshops were held to explore curricular needs and to develop and test materials. The participants were two to one African and were from all levels of education, with the Americans fully involved and serving as project managers. The process of inquiry was applied to the workshops as well as the teacher training materials and curriculum. Thorough testing of approaches and units was a keynote of the workshops. The units were made as generalizable to Africa as possible, stressing the inquiry process over specific materials.

By 1969, fifty-four units had been completed, tested and revised. The workshops produced discrete units that could supplement curricula or be used as unified curriculum packages. Teacher guides were developed as well as films showing APSP materials being used in the classroom. Formal evaluation processes and training in evaluation began with a workshop in 1965 which produced a Source Book for Evaluation, and continued to focus on techniques for teacher training, the weak link of the APSP. Seven of the eleven Science Centers planned (Ghana, Kenya, Malawi, Nigeria, Sierra Leone, Tanzania, and

Uganda) were established by 1967. Today these centers are either still in existence or have been incorporated into Institutes of Education, the national curriculum development and in-service centers.

c) Science Education Programme for Africa

In August, 1969, the African Advisory Board of APSP met in Takoradi, Ghana to explore ways to "Africanize" the management of APSP. AID was in agreement with that objective, but wished to see an established program before funding would be shifted from the APSP to the participants. Six months later, representatives of the Ministries of Education from nine Anglophone African countries met, and the Science Education Programme for Africa (SEPA) was formally established. A process of incorporation as a Pan-African organization was established, recognition sought from member governments and work begun under an elected Executive Secretary. Small grants from UNESCO and the Centre for Educational Development Overseas allowed SEPA to establish and supply offices in space made available to it by Ghana. For fiscal years 1971-76, however, basic funding came through the AID grant to the APSP, supplemented by membership dues. SEPA saw its role primarily as a generative force for improved science education in Africa. The specific objectives of SEPA were set as:

- o to serve as a clearing house for exchange of information on science education in Africa, through workshops, conferences and other appropriate means of communication
- o to support and encourage the production of instructional materials as well as the manufacture of scientific equipment and materials from locally available resources
- o to carry on research activities in relation to the teacher and learner and use the findings for the development of more appropriate approaches to science education
- o to cooperate with other educational programmes.

These goals have been met in various ways with differing degrees of success. The role that SEPA has played has put it in the forefront of science education in Africa and has created additional expectations for the organization.

2. Implementor

Most of SEPA's visible work has been in the development of manpower and materials and the processes for doing both. Two training programs have been especially formative in SEPA's development as a Pan-African organization: the International Centre for Educational Evaluation (ICEE) and the Science Educators Training Course (SETC). The ICEE was begun by the APSP in 1967 at the University of Ibaden in Nigeria, but was supported by fellowships administered by SEPA. As it is an integral part of the university, it can provide expertise to other SEPA sponsored activities. The SETC, at Njala University College in Sierra Leone, was a joint APSP/SEPA project with its leadership funded by SEPA until 1979. Over 125 educators have received post-graduate training at the ICEE, and over 90 have attended the SETC on SEPA fellowships, which were begun by a direct AID grant to SEPA. SEPA's fellowships for both programs are highly valued as the programs are unique in Africa and because SEPA's selection process assures that the participants are both well qualified and that they will be appropriately posted upon their return.

Figure 1

GRADUATES OF SETC PER COUNTRY PER YEAR

COUNTRY	FINANCIAL YEAR								TOTAL
	75	76	77	78	79	80	81	82	
Botswana				1	1				2
Cameroon							1	1	2
Ethiopia							1	1	2
The Gambia	1	1	1	1	2	2	2	1	11
Ghana	1	1	1	1		2	2	2	10
Kenya	1	1	1			2	1		6
Lesotho	1	1	2	1	1	2			8
Liberia	1	1		1			1	1	5
Malawi			1				2		3
Nigeria				1	1	2		1	5
Sierra Leone	1	2	1	1		2	3	1	12
Somalia								1	1
Swaziland				1				2	3
Tanzania								1	1
Uganda	1		2		1	2			6
Zambia	2	1	2		2	2	2	2	13
									90

There are continuing requests of SEPA for assistance with in-service education: the training of trainers, upgrading teachers and introducing new science and mathematics teaching techniques. SEPA's current strength lies in the number of people who have been through those kinds of workshops and the ICEE and the SETC, where SEPA materials or resource persons were used. Many of the most sought after people in science education and teacher training are SEPA resource people. Many of them identify themselves as SEPA people (or SEPAlings) even when not recruited through SEPA. It is through the SEPA-- trained people and materials developed during their training that the influence of SEPA is transmitted, even though the name SEPA may not be attached or SEPA's work be explained. Recognizing this strength, SEPA brought together in 1979-83 many of the SEPAlings, with other educators, in a series of short re-union/workshops on dissemination of SEPA's opportunities and offerings.

Figure 2

ICEE ENROLLEES - BY COUNTRY AND YEAR

Country	Year								Total
	72-3	73-4	74-5	75-6	76-7	77-8	78-9	79-80	
Botswana							1		1
Cameroon					1	1			2
Ethiopia	1							1	2
Ghana	2	2	1		1	1	2		10
Kenya	3				1	2	1	3	10
Lesotho				1			1	1	3
Liberia	1	1	2		1				5
Malawi					1	2		1	4
Nigeria	7	3	3	3	8	3	11	12	50
Sierra Leone	1	1	1		1	1	2	1	8
Somalia								1	1
South Africa					1				1
Swaziland				1			1		2
Tanzania		1		2	1	2	1	1	8
Uganda		2		2	2	2	1		9
Zambia			1		2	1		1	5
India						1	1	1	3
TOTAL	15	10	8	9	21	16	22	23	125

Assistance with materials development, textbook revision and textbook adoption continue to be areas in which SEPA is looked to for leadership. While producing materials was not

one of SEPA's goals, its Handbook for Teachers (1974) and its Source Book for Science Education (1976, 1979) are in great demand, but have been out of print. The 54 APSP science units were made more Pan-African, and they too are in great demand, but not available. Workshops in environmental education have produced a draft of a source book. Other workshops produced seven manuals for the incorporation of scientific processes and environmental education into the work of the various organizations involved with out-of-school youth and adult groups. Work on the development of scientific and mathematical concepts in young children led to a series of SEPA publications entitled Essays on the African Child. These Essays and work on environmental education resulted in SEPA written and UNEP published book: The Child in African Environment.

3. Leader

Work in environmental education was a new area of focus for SEPA. A grant from the Carnegie Foundation not only made work in this area possible, but also provided SEPA with an entry to the Francophone countries. SEPA had always wanted to include the Francophone countries in its membership, but the monies from AID through the APSP had to be spent on Anglophone Africa only. The success of SEPA in producing curricula and teachers interested in science helped to spawn the African Curriculum Organization (ACO). The ACO is located at the University of Ibaden in Nigeria and is an association of Institutes of Education, one from each member country. ACO and SEPA have supported each other's work and have received grants for joint projects from a variety of donors, including the Commonwealth Fund for Technical Cooperation (CFTC) and the German Foundation for International Development (DSE). In 1978 and 1979 SEPA assisted in the birthing of a new UNESCO organization: the Network for Educational Innovation Development Assistance (NEIDA) which assists all African Ministries of Education as a clearing house for educational ideas, needs and developments.

SEPA is a Pan-African organization of fourteen members: Botswana, Ethiopia, Ghana, The Gambia, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Swaziland, Tanzania, and Zambia. There are four Associate members: Ivory Coast, Lesotho, Mauritius, and Camerouns, which pay nominal dues for a two year familiarization process. These and other countries in Africa continue to look to SEPA as a source of personnel, materials, training,

funding, and as a network for information and resources. Specific requests of SEPA from the six countries visited for this review include, in order of frequency:

- For SEPA to become a Production Center
- Material development expertise
- Assistance with environmental education
- Assistance with integrating mathematics with science
- Assistance with making mathematics less theoretical
- Assistance with middle school curriculum
- Assistance with science technology
- Assistance with rural development and science
- Assistance with science and out-of-school education
- More research in concept development

In addition, all countries requested that SEPA's Handbook, Source Book, and 54 APSP science units be edited and reprinted. It was suggested that if SEPA were to establish a Production Center, (it was reported in 1980 that the African Development Bank was interested in the concept), it would be able to help backlogged government printers and produce revenue for SEPA.

4. Links

Most countries which have interacted with SEPA have institutionalized various aspects of their involvements, the Science Centers being an obvious example. Recent interactions with SEPA and some of the results as mentioned by the six SEPA members visited for this report are:

Botswana, which has paid her dues for FY 1984, was host to the Twenty Year Review of Science Education in Africa Conference and an in-service workshop in environmental education in 1980. She has ICEE and SETC trained educators in various parts of her educational structure. She has found SEPA most useful for: the scholarships to ICEE and SETC, access to resource people for in-service training and materials development workshops, and for aid in identifying donor agencies for specific projects.

Ghana hosts SEPA in Accra, providing space and identifying local resource people. She is current in payment of her dues. APSP/SEPA materials and science units are used throughout the Primary school system and in the Teacher Training Colleges. Educational leaders have been sent to both SETC and ICEE, and they have had a strong impact on the Science Coordinators Training programs. The staff at SEPA and those in various offices and institutions of the

Ministry of Education have been mutually supportive. Ghana has offered its Book Development Council as a site for a SEPA training program and has recently made available to SEPA 300 copies of new curriculum material on science and technology for testing.

Kenya, like Ghana, has had an extensive and multifaceted relationship with SEPA. The current SEPA resides there. Many Kenyans trained on SEPA scholarships at ICEE and SETC had leadership roles in the 1980, Strategies for National Teacher Education Programs regional conference. SEPA materials are used in the primary school, and teacher training systems and SEPA resource people are used in Primary curriculum and materials development workshops and in-service courses.

Liberia, while many trained at SETC and ICEE are either no longer in the country or are inactive in education, Liberia remains current in her dues payments. Adapted SEPA materials are in use in the University, but none are in use in the schools. In 1980, SEPA edited and produced a Handbook of Vocational and Technical Education in Liberia. In 1982, Liberia hosted a workshop on the dissemination of SEPA materials.

Sierra Leone, the SETC at Njala University College puts Sierra Leone at the hub of one of SEPA's networks, as well as producing curriculum and materials for her classrooms. Many Sierra Leoneans are in SEPA's resource pool; one of them has recently edited the second edition of SEPA's Source book for Science which the Government Printer has just printed.

Uganda, 1983 dues are paid, and she has offered Makerere University as a site for a SETC that would include mathematics and agricultural education. Fellowships to SETC and ICEE and participation in various SEPA workshops have developed group authorship expertise in curriculum development.

Tanzania was not visited, but a representative was interviewed and reported that APSP (and AMP) curriculum units had been translated into Kiswahili and were used in the Primary schools. She has only recently made use of scholarships opportunities at the SETC, but has sent people to recent workshops in Ethiopia, Botswana, and Swaziland.

Zimbabwe is not a member of SEPA, but has developed a comprehensive Secondary science program ZimSci, from some of SEPA's materials and with the assistance of SEPA people.

Conclusion: AID supported the development of SEPA as a Pan-African organization to implement curriculum and teacher training in science education. SEPA's processes and work in manpower, curriculum and materials development permeates the thinking, processes and institutions involved in science education in Africa. SEPA is the leader in science education and there are additional areas of leadership for which SEPA is needed.

C. The Education Development Center

The Education Development Center, Inc. (EDC) was established in 1958 to carry on the work of science curriculum development begun a few years before at M.I.T. In 1960, EDC participated in the International Conference on Science in the Advancement of New States held in Rehovath, Israel at which the need for science education in Africa was discussed. The following year, the Ford Foundation and the International Cooperative Administration sponsored a long workshop at Endicott House in Massachusetts for African and American educators concerned with curriculum development and teaching needs. Later that year, AID funded EDC to assist Anglophone African countries to develop a mathematics curriculum based on the work of the School Mathematics Study Group. A similar grant to EDC from AID in 1965 started work in science education in Africa.

Though both programs were run by EDC, they were independent of each other as they had differing goals: AMP to produce texts to change the curriculum and APSP to develop a process and materials for teaching Primary science. Figure 3 shows the extent of AID's funding for these programs.

Figure 3

AID GRANTS FOR MATHEMATICS AND SCIENCE EDUCATION TO EDC

<u>Year</u>	<u>Program</u>	<u>Amount</u>	<u>Total</u>
1961-1969	AMP	\$3,625,310	
1970-1975	AMP	<u>1,566,560</u>	
			\$5,191,870
1964-1970	APSP	2,736,962	
1971-1976	APSP	<u>899,120</u>	
			\$3,636,082
1971-1976	SEPA	463,195	<u>463,195</u>
			\$9,291,147

Aid to AMP was discontinued because:

- . there was an emerging local capacity in curriculum development
- . the teacher training task was too big
- . no progress or intent to institutionalize EAMP/WARMP
- . needed better assurance that those trained would be used as trained
- . resource would be put to helping textbook distribution problems bilaterally.

Grants to EDC for APSP stopped because the groundwork had been laid and SEPA was functioning as a Pan-African science education leader and resource. AID would continue to fund SEPA until 1981.

Though EDC ceased to have a grant involvement with SEPA, the two organizations maintained cordial and complementary relations. EDC provided occasional contract support to SEPA for editing documents and support when requested for ideas and U.S. contacts. As publisher of the APSP science units and many of the early SEPA documents, EDC has continued to receive and respond to requests for the documents and has referred people to SEPA when appropriate.

EDC has worked in Africa, India, Afghanistan, Iran, Saudi Arabia, , Dominican Republic, Colombia, Nigeria, and Mali on projects involving institution building in: science and technology, training and development, or rural health services.

Current international projects include:

- o Jamiah-King Faisal University Project (with A.E.D.) for institutional development; U.S. Treasury
- o International Nutrition Communication Services (in consortium) for short-term consultants, catalogues, manuals, and reviews; AID
- o Teacher-Text-Technology Initiative for coordinating institution building and services to education in Africa; USIA

These projects require only a small in-house staff as they rely on a network of consultants, of which EDC has over 500, many of whom have experience working internationally in science and mathematics.

In 1981, EDC's Board of Trustees elected a new President, Janet Whitla who had been working with EDC since 1966. Under her direction, EDC is building a capacity of a full-service institution for:

- Teaching and Training
- Curriculum Development
- Mass Communication and Learning
- Educational Institution Building
- Educational Technology
- Evaluation for each of the above

EDC has embarked on projects of its own initiative in the Center for Learning Technology and expects to be able to develop other initiatives in the future. Two other specialized centers involving health services and publications provide EDC with experience that would be transferable to Africa. A staff of about eighty-five manage grants from major U.S. foundations and a variety of U.S. Government agencies, and works in consortium with a wide range of organizations and academic institutions.

Paradoxically, EDC's weaknesses as an organization to work on the development of SEPA are where its strengths seem to be. It has not had much recent experience in Africa, although the Teacher-Text-Technology Initiative work will strengthen that area. While the majority of its consultants in mathematics and science are veterans of the AMP and APSP grants they have had little recent experience in Africa. In addition, the organization's staffing is very weak in the inter-cultural and international areas. EDC's strengths derive from the consul-

tants, capabilities, and experiences discussed above, its program management capabilities and its ability to work with other organizations.

Conclusion: Through grants from AID, EDC has had a long and intimate involvement with the development of mathematics and science education in Africa with AMP, APSP and SEPA. EDC has additional international experience with institution building in science and technology. It has the capability for and interest in providing assistance to SEPA.

D. SEPA's VIABILITY

1. Overview

1976 was the last year of AID's grants to EDC and APSP and the first year of a direct AID grant (\$28,515) to SEPA. As SEPA became fully independent of EDC, the work load of the Executive Secretary expanded with increased fund raising, liaison, and program management. In 1975 the Representative Council voted to divide the responsibilities of the Executive Secretary into two positions: The Executive Director and the Director of Programmes. The latter position would be responsible for program development and management, while the Executive Director was to be concerned with the development and management of SEPA and the Secretariat. From 1974 to 1979, the Director of the Science Educators Training Course was also a member of the Secretariat.

The Executive Secretary and the Executive Director reported to a Representative Council consisting of two representatives of each member state, one from the Ministry of Education and one from an academic institution. An Executive Committee, six elected from the Representatives Council, was empowered to represent the Council between Council meeting. Figure 4 is a schematic drawing of SEPA's Secretariat.

Dr. Hubert Dyasi served as the Executive Secretary until the office was split and then, after a leave, returned as Director of Programmes from 1976-8, and 1981 until 1983, when he went on leave again. Mr. E. T. Cole served as the first Executive Director until he left the position in the first quarter of 1979. Dr. Rufus Alabi was elected to fill the position and held it until he resigned at the end of 1981. With the exception of Dr. Alabi, all of the professionals on the Secretariat had been actively involved with SEPA. Most of the membership now feel that the chief administrative officer should be an educational administrator with experience in SEPA. SEPA and Dr. Dyasi are mentioned in the same breath by many outside of the organization, while some inside realize that they have depended on his availability and interest for

213

too long. On the other hand, too close an association can be detrimental.

Figure 4

SEPA'S ORGANIZATION

REPRESENTATIVE
COUNCIL

EXECUTIVE
COMMITTEE

EXECUTIVE DIRECTOR

In Gabarone, Botswana in May of 1980, SEPA held a Twenty Year Review Conference which looked at the development of science education in Africa beginning at the Rehovath Conference in Israel. A large grant (\$70,000) from the Carnegie Foundation allowed for collection of materials, data and interviews. These were collected into Volume I, A Report of Twenty Years of Science Education in Africa, published by SEPA in 1981. Volume II reports on the conference and is particularly noteworthy for the reports of sub-groups which looked at the future of SEPA in four areas:

- . Structure of SEPA
- . Funding of SEPA
- . Dissemination of SEPA Ideas and Materials
- . Programmes for the Eighties

Each of these areas reflected basic concerns about SEPA, concerns which are germane to this review.

Since the Botswana Conference, SEPA's activities have atrophied considerably. The Executive Director resigned; the Director of Programs has been on extended leave of absence because he has not been paid since May 1982, and the office space

has been given up. Ghana's Ministry of Education has provided space for the SEPA records and occasional secretarial and accounting personnel near the office of Margaret Tawia. Ms. Tawia and Dr. George Collison, Ghana's representative to SEPA, are acting as SEPA's caretakers. The immediate cause of this atrophied state was the expenses involved in the Conference which, combined with other debts, has left SEPA \$217,893.33 in unpaid bills. Half, \$110,046.22, is owed to Ethiopian Airline for bookings arranged on credit with the airline's agent, and the remainder is owed to staff for unpaid salaries, benefits and increments.

Though atrophied SEPA remains very much alive, both physically and spiritually, SEPA has finally won the coveted Observer Status at the Organization of African Unity, which provides SEPA with further visibility and recognizes it as a special agency in science and technology education. It has been officially recognized by the Conference of Ministers of Education of both Francophone and Anglophone Africa, and most importantly, seven members: Botswana, Ethiopia, Ghana, Liberia, Swaziland, Uganda, and Zambia, have made dues payments for FY 1984.

2. Secretariat

At the Botswana Conference, the group studying structural needs of SEPA for the future made recommendations about re-aligning the directorship and administrative positions and adding new staff. They discussed the question of the need for Regional Centers and decided that if the Representative Council members did their work well, there would be no need for such centers. They recommend the establishment of regional program coordinators, paid with honoraria, and encouraged interested member states to develop national SEPA institutions, short of official Commissions. These issues are similar to five which were raised by the interviewees for this report:

- . Need for an executive with science education and administrative experience
- . Infrequent Executive Committee Meetings
- . Need for better accountability
- . Poor Communications
- . The question of regional offices

Until such time as SEPA can afford an extensive Secretariat, it should not consider having one. While prestige of an administrator is important, a service organization, which SEPA is, also needs leadership which is willing to work hard and have inexpensive needs and tastes. Regional coordinators for programs would be useful when there are enough programs in

25

a region to coordinate. They should be paid from program overhead as should most of the salary for a Director of Programmes in the Secretariat. The distance between Accra and Eastern or Southern Africa are such that Regional offices or centers are appealing as a way of maintaining the presence and responsiveness of SEPA to those areas. However, they would be expensive to maintain and duplicative in work unless there were a large number of SEPA programs in those regions. If communications within the Secretariat, between representatives and their countries and between the Secretariat and programs in the field were improved, the questions of accountability and infrequent meetings would dissipate.

3. Finances

The nine founding members of SEPA pledged \$600, "good faith" annual grants to SEPA; but with the impending end of EDC support in 1976, the annual dues were raised to \$3,300 and \$5,500. Current fees are about double this range and are based on a country's level of contribution to the O.A.U. In 1976 one third of SEPA's income was from these dues (\$30,000). As a result of efforts to increase membership, by 1980 the annual dues contribution totaled \$81,000. The process for establishing dues--the budget for the Secretariat prorated, based on the O.A.U. formula--seems equitable and reasonable. The question of whether resultant dues are too expensive will be answered by what a country gains for its contribution.

Getting countries to establish line items in their budgets for the dues was often difficult, and getting the actual payment made was another hurdle. The internal ability to pay in any given year and the external problems of loss of foreign exchange and of a country's political position vis-vis Ghana, SEPA's host, were the factors which spelled the difference between budget and funds available. In spite of these problems, and because of the dedication of the staff, SEPA was able to keep expenses close to the level of actual income.

Besides the dues which helped support the operation of the Secretariat, SEPA has been able to generate additional funds through overhead from grants for projects and programs. The monies raised were kept in three accounts:

- . Ghana--for dues and support of the Secretariat
- . Liberia--for project grants
- . Kenya--for Kenya's dues, to provide easier access to funds for Eastern Africa programs

The Liberian account, because of its U.S. dollar base, allowed for easier transfer of funds to other countries for fellowships

and projects. The status of this account was in question because the Executive Director had established his own account in the same bank and facilitated exchanges between the two accounts. In October 1983, Ms. Tawia was able to visit Liberia and re-establish the separateness of SEPA's account. The Kenya account could only be drawn upon by signators at the Kenya Institute of Education with an authorizing letter from the Secretariat in Accra. Kenya's dues are in arrears because they felt that this fund was not properly being used.

The need for better accountability, mentioned by the interviewees as a structural problem, was also applied to the fiscal problems of SEPA. The accounting process as established was reasonable; however, the expectation of above-board behavior coupled with not so rigorous scrutiny and an executive with little prior administrative experience let debts pile up quickly. These tendencies were exacerbated by the end of direct AID funding, a reduction of grants from donors and the overly expensive Botswana Conference. Tighter controls on spending would have reduced the problem significantly. Today the Secretariat is effectively not operating. There are no ongoing programs nor proposals submitted for funding.

In addition to the issue of accountability, the interviewees raised seven concerns devolving from funding issues:

- . the expense of the Secretariat
- . the problem of foreign exchange
- . the location of the Secretariat
- . the loss of donor support
- . the crediting of in-country program costs toward due
- . the need for priorities and stated programs
- . the question of manpower development versus the development of structures.

The expense of the Secretariat comes from two basic costs: administrative salaries, housing and benefits, and expenses for Executive Committee and Representative Council meetings. Ghana hopes to provide a house for the chief executive officer and the salary is comparable to that of heads of other international organizations. Support for a program director should come out of program overhead and only minimally be supplemented by the Secretariat. The cost of meetings could be reduced by keeping the Executive Committee small, having it meet twice yearly and having the Representative Council meet every second or third year. Frequent communication between SEPA and its Representative Council, and with country or regional SEPA support groups, would provide input and additional oversight.

27

If SEPA had a stated slate of programs, priorities, and time lines, the issues above would be greatly reduced. Countries would be more willing to pay, and on time, if they could be sure of what they would be getting for their dues. The issue of foreign exchange would be raised less often. Where foreign exchange remained a problem, temporary arrangements would be made to credit support for SEPA activities in the country against her dues as SEPA has done in the past. The issue of foreign exchange is occasionally a political issue, as is the question of SEPA's headquarter's location. Some countries are unhappy with Ghana's politics, her financial situation is grave, and access to Accra is not easy for Eastern and Southern Africa. While most countries visited saw no reason to move the headquarters, citing Ghana's support and the political and economic changes in other countries, Nigeria, Banjul and Nairobi were suggested as possible alternative sites. Without compelling and attractive alternatives, it makes no sense to move the Secretariat.

The Funding of SEPA sub-group at the Botswana Conference focused on many of the same concerns as the interviewees, with the additional concern that SEPA become self-reliant as well as self-sufficient. Self-reliance would allow SEPA to make awards, support publications and have seed money for developing programs. They urged:

- . harder work to assure that dues were forthcoming on a timely basis
- . increased membership, including Francophone countries, for increased funds
- . country assumption of increased share of its delegates support to SEPA programs
- . contract or sub-contract consultancy work with overhead, for fund development
- . more aggressive publishing ventures to generate income
- . seeking endowment funds from donor agencies

With the exception of the last, which is not very realistic, all of the other suggestions were echoed by those interviewed. In addition to generating revenue, the publishing center idea would also allow SEPA to publish its own journals and news letters and thus increase its visibility in Africa and the world. SEPA is respected and known in many circles, but what it is and can do is not as widely known as it should be. Interestingly, no one suggested the development of a "Friends of SEPA" group as a fund raising and/or visibility enhancing adjunct to SEPA. Perhaps it is because SEPA helped to found the Forum for African Science Educators, which is independent of SEPA, or perhaps it is that as a Pan-African governmental

organization such a group would be inappropriate.

As a Pan-African organization SEPA has focused on manpower development, particularly in skills development in various aspects of science education. This was a natural response to its evolution as the implementor of the APSP materials and process. Some of the interviewees felt that SEPA should shift its emphasis to the development of curricula and other structures to which the manpower could be applied. This idea, and that of shifting SEPA from a generator to a producer of materials and programs, should be decided by the member countries' representatives to SEPA.

Conclusion: SEPA's Secretariat is currently inactive due to poor fiscal management which has left it over \$200,000 in debt. Issues have been raised about structural and fiscal processes; suggestions for correcting them have been offered. Improved accountability and communication would help ameliorate the problems.

E. REVITALIZATION OR...

1. Needs and Process

The needs of African countries for assistance in mathematics and science with:

- . integrative curriculum development
- . in-service teacher training
- . revision and adaptation of texts
- . development of applied supplementary readers and materials
- . laboratory equipment and
- . networking

have been discussed above. SEPA has a good record of providing many of these services, and as an established Pan-African organization, is well situated to be of continuing assistance. There are other Pan-African organizations like ACO, the Forum for African Science Educators and various Mathematics Unions working on some of these needs, but they are either very specialized or too generalized to be effective on a broad scale. Only SEPA works at all grade levels and educational institutions in curriculum and materials development, teacher education and classroom instruction.

All who were interviewed were in agreement that the decisions about whether and how SEPA should be revitalized must be made by the Representative Council. They recognized that the current debt and reduced dues payments create a downward spiral

that can best be stopped with outside assistance--funds and manpower--and an immediately developed feasible plan for putting SEPA on a firm footing. Because of AID's historical interest and support of mathematics and science education in Africa and as the basic supporter of SEPA through 1981, AID is looked to as the logical source of outside support. If AID were unable to provide direct assistance to SEPA, it was then hoped that AID would fund the Education Development Center, Inc. to provide that assistance.

The process for assisting SEPA should be in two steps: planning and action. The planning stage would take from six to nine months and involve three steps:

- . collection and dissemination of options to the Representatives
- . Executive Committee meeting to explore options and develop proposals
- . Representative Council meeting to approve proposals

Through this report would be a starting point for data on options, one or two members of the Executive Committee might be sent to visit other member countries and SEPALings for their concerns and input. This information should be sent to the Executive Committee members prior to a planning workshop meeting. The proposals of the Executive Committee should then be circulated to the Representatives in advance of the Council meeting. The Representatives would be expected to vote on the direction of SEPA's future, and agree on a process for achieving it. The cost of this stage would be approximately \$85,000. (Appendix 4)

The second stage would depend upon what the Representative Council decides, (possible options other than revitalization are discussed below), but would have to address the issues discussed in D above:

- | | |
|-----------------------------------|-----------------------------|
| . Director qualification | . accountability, process |
| . cost of meetings | . programs |
| . membership dues, representation | . priorities and time lines |
| . office location | . debt |
| . communications | . regionalization |

SEPA could need assistance from AID and EDC to help select a new Director, develop programs and communications, establish a publication center, move offices, structure debt payment, etc. Whatever is decided, however, must be done so by the Representative Council and would have to be a feasibly and carefully

worked out plan. Financial support for these activities would very considerably, and the time needed to assist them could run from a few months to three to five years.

Above and beyond the possible immediate needs of revitalization are programmatic needs. Once its house is in order, and perhaps as a part of that ordering, a revitalized SEPA will need direct support from AID or other agencies for programs such as SETC and ICEE fellowships, a printing/publishing center, and publication and distribution of the environmental sourcebook. Indirect, or bilateral support to SEPA programs in specific countries, or for those countries to participate in SEPA workshops, or buy publications, would be useful to the revitalization process. AID should consider providing both kinds of assistance and encourage other donor agencies to participate.

2. Alternatives

The preceding process might not produce a consensus that SEPA should be revitalized, and certainly alternatives to revitalization should be discussed by the Executive Committee in its planning workshop. A few of those interviewed felt that SEPA had done its work--influencing new ideas and approaches to science education. They felt that SEPA had laid a groundwork that could be built upon by individual countries, that SEPA should close down. A few felt that closing would cut the losses, that the Secretariat was too costly in both time and money for the return.

Closing would not have to be the end of SEPA's work, as there are materials, processes and people that SEPA has developed which could be employed to assist individual countries. Funding could be provided to countries which are interested in the SEPA approach to bring in experienced SEPA trained personnel and SEPA materials for reference and assistance or to mount their own programs. The German Foundation for International Development (DSE) is the major practitioner of this funding approach. This approach could be tied to a regionalization of SEPA, a network of regional support groups which would identify a national Institute of Education as a focal resource center. The network members would pay only for services provided and a small donation for access to the network.

The UNESCO office in Dakar is very concerned about the number and cost of regional and Pan-African curriculum and materials development organizations. It has assigned Dr. Boma, a specialist in curriculum development and educational resources, to study the problem and try to effect a merger within

three years. They feel that countries will give up useful and important organizations such as SEPA because of the cost of supporting each of them. Dr. Ogunnyi, Director of UNESCO's Network for Educational Innovation Development Assistance (N.E.I.D.A.), suggested that SEPA might consider becoming a part of a new network for science and technology that N.E.I.E.A. was evolving. That alignment, if phased in, would require no additional dues from member states and would provide SEPA with all of the overhead costs and equipment that a well-supplied Pan-African office would need.

Conclusion: AID has a vested and historical interest in SEPA and the development of mathematics and science education in Africa. Many countries have mathematics and science education needs with which they hope SEPA will be able to assist. Directly or through EDC, AID should assist SEPA with a process of studying and choosing revitalization options. Further AID support to SEPA should depend on the quality and nature of the options SEPA chooses to follow.

IV. RECOMMENDATIONS

1. That AID support an attempt to revitalize the Science Education Programme for Africa (SEPA). SEPA has demonstrated Pan-African support, is dormant because of poor management, and its skills are in demand for much needed mathematics and science curriculum and materials development. AID has played a dominate role in mathematics and science education in Africa for twenty years, supported SEPA's growth and has a policy commitment to assist with institutional development.
2. That the revitalization attempt be carried out through the mechanisms of SEPA. It is important that AID be seen as allowing the institutional development process to take place and not as directing what form the revitalization should or should not have.
3. That AID support the revitalization process suggested by the membership. The suggested process: collection of information and options, a planning workshop meeting of the Executive Committee and meeting of the Representative Council to make policy decisions, is consistent with SEPA's governmental process and would provide for both member country and interested individual and organizational input.
4. That AID's support to SEPA's revitalization effort should be through a private agency or organization. Because SEPA has debts, monies given directly to it could be attached for debt repayment. As there is not a functioning Secretariat, no staff is available to provide the kind of logistical, paper and fiscal assistance needed for the effort.
5. That AID fund the Educational Development Center, Inc. (EDC) to assist in SEPA's revitalization attempt. AID has worked through EDC to support mathematics and science education in Africa, including its development of SEPA. EDC has: international experience in institution in science and technology, much of the needed expertise inhouse, maintained contacts with SEPA, and is warmly regarded by those with whom it has worked in Africa.
6. That AID's support be considered in two phases - the first for revitalization policy planning, and the second for support of policy implementation. This will allow AID to

43

consider what further support it wishes to make, based on the quality of the revitalization plans or the options chosen. The first phase should take six to nine months and cost about (\$85,000). (Appendix 4)

7. That if EDC is used for the support of the second phase, AID encourage EDC to seek assistance from University of Florida, University of Illinois, University of Georgia, Boston University, or other institutions which are at the forefront of mathematics and science education work. While EDC has a large roster of consultants with international mathematics and science education experience, many of these experiences are dated. The kind of experience that would be an asset will depend, of course, on what support is needed.
8. That in the second phase, AID give consideration to direct grants to SEPA for specific projects. Direct grants are a vote of confidence and could provide support to special needs or projects that would enhance the revitalization process. Possible projects and their costs will be found in Appendix 4.
9. That AID give consideration to supporting the printing of SEPA's Handbook, Source Books and the APSP science units if printing them is not part of the second phase. These documents are in great demand. A great service could be rendered to science education if each interested country could receive a large number of copies for reference work and to use for curriculum development. The drafted but not yet published environmental source book is included in this list. (Appendix 4)
10. That AID support the development of a Science and Mathematics Educators Training Center for Francophone Africa. A center is needed that could train teacher educators in new approaches to science and mathematics and that is attuned the changing curriculum needs of the Francophone countries. Such a center could use the SETC as a model to work from. Support would include provisions for fellowships as well as administration, curriculum development and staffing. (Appendix 4)
11. That USAID provide bilateral support to SEPA member countries. If SEPA is revitalized, membership and participation in SEPA can be encouraged through AID support to countries for participation in SEPA activities. Activities could include fellowships for ICEE and SETC, reproduction and distribution of SEPA materials, workshops for curriculum and materials development, in-service workshops, and

the use of SEPA trained consultants. The cost of this kind of assistance could vary considerably, but need not be in addition to current budgets if focus or priority is adjusted.

12. That if SEPA is not revitalized, USAID give consideration to bilateral support to countries for mathematics and science education, especially at the Middle/Junior Secondary school level. Whether SEPA exists or not, many countries have an immediate need for assistance in these areas. As AID has had long-term involvement in innovation and development in those subjects in Africa, it would be appropriate for the Agency to continue its support.
13. That AID approach USIA on behalf of SEPA to explore the possibility of assistance with the distribution of SEPA materials through USIS. Materials distribution is a major problem with Africa, a solution to which could be the utilization of USIA's network for getting things to USIS offices.

5

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APPENDIX I

EDUCATION DEVELOPMENT CENTER, INC.

BALANCE SHEET

September 30, 1983 and 1982

<u>ASSETS</u>	<u>1983</u>	<u>1982</u>
Current assets:		
Cash and cash equivalents	\$ 788,789	\$ 903,631
U. S. Treasury Notes (market value 1983 - \$1,039,488, 1982 - \$1,009,050) (Note 1)	1,014,166	1,000,008
Accounts receivable	376,328	176,110
Unbilled costs on grants and contracts	507,995	476,014
Inventories (Note 1)	27,962	34,148
Prepaid expenses and advances	51,105	69,243
Total current assets	<u>2,766,345</u>	<u>2,659,154</u>
Equipment, leasehold improvements and furniture and fixtures, at cost (Note 1)	501,704	501,704
Less accumulated depreciation and amortization	<u>256,179</u>	<u>212,676</u>
	<u>245,525</u>	<u>289,028</u>
	<u>\$3,011,870</u>	<u>\$2,948,182</u>
 <u>LIABILITIES AND FUND BALANCE</u> 		
Current liabilities:		
Advances on grants and contracts (Note 1)	\$ 298,116	\$ 332,761
Accounts payable	266,162	263,273
Accrued expenses	98,861	120,833
Deferred support - National Science Foundation (Note 3)	-	86,847
Total current liabilities	<u>663,139</u>	<u>803,714</u>
Fund balance	<u>2,348,731</u>	<u>2,144,468</u>
	<u>\$3,011,870</u>	<u>\$2,948,182</u>

27

EDUCATION DEVELOPMENT CENTER, INC.
 STATEMENT OF REVENUE, EXPENSE AND CHANGES IN FUND BALANCE
 Years ended September 30, 1983 and 1982

	<u>1983</u>	<u>1982</u>
Revenues:		
Grants and contracts (Notes 1 and 2)	\$5,034,500	\$4,351,100
Royalties - restricted use (Note 3)	168,510	-
Royalties - unrestricted	<u>19,714</u>	<u>17,816</u>
	<u>5,222,724</u>	<u>4,368,916</u>
Expenses:		
Direct costs:		
Salaries and employee benefits (Note 5)	1,159,320	1,428,022
Materials and services	1,207,695	1,233,927
Travel	377,219	219,070
Consultants	370,341	362,276
Subcontracts	<u>959,730</u>	<u>475,123</u>
	4,074,305	3,718,418
Administrative and indirect costs:		
Salaries and employee benefits (Note 5)	624,793	628,506
Other	<u>503,856</u>	<u>543,354</u>
Total expenses	<u>5,202,954</u>	<u>4,890,278</u>
Excess (deficiency) of operating revenue over expenses (Note 1)	19,770	(521,362)
Interest income	<u>184,493</u>	<u>241,859</u>
Excess (deficiency) of revenue over expenses	204,263	(279,503)
Fund balance at beginning of year	<u>2,144,468</u>	<u>2,423,971</u>
Fund balance at end of year	<u>\$2,348,731</u>	<u>\$2,144,468</u>

EDUCATION DEVELOPMENT CENTER, INC.
STATEMENT OF CHANGES IN FINANCIAL POSITION

Years ended September 30, 1983 and 1982

	<u>1983</u>	<u>1982</u>
Sources of working capital:		
Excess (deficiency) of revenue over expenses	\$ 204,263	\$ (279,503)
Expense not involving working capital:		
Depreciation and amortization	<u>43,503</u>	<u>42,447</u>
Working capital provided from operations	247,766	(237,056)
Uses of working capital:		
Additions to property and equipment	<u>-</u>	<u>104,273</u>
Increase (decrease) in working capital	247,766	(341,329)
Working capital at beginning of year	<u>1,855,440</u>	<u>2,196,769</u>
Working capital at end of year	<u>\$2,103,206</u>	<u>\$1,855,440</u>
Changes in components of working capital:		
Increase (decrease) in current assets:		
Cash and certificates of deposit	\$ (114,842)	\$ 159,611
U.S. Treasury Notes	14,158	(499,992)
Restricted cash - National Science Foundation	-	(99,103)
Accounts receivable	200,218	(8,875)
Unbilled costs on grants and contracts	31,981	51,852
Inventories	(6,186)	(28,015)
Prepaid expenses and advances	<u>(18,138)</u>	<u>21,524</u>
	107,191	(402,998)
Increase (decrease) in current liabilities:		
Advances on grants and contracts	(34,645)	(159,643)
Accounts payable	2,889	113,013
Payable to National Science Foundation	-	(99,103)
Deferred support - National Science Foundation	(86,847)	86,847
Accrued expenses	<u>(21,972)</u>	<u>(2,783)</u>
	<u>(140,575)</u>	<u>(61,669)</u>
Increase (decrease) in working capital	<u>\$ 247,766</u>	<u>\$ (341,329)</u>

APPENDIX 2

REPORT ON INTERVIEWS HELD

Between October 15 and December 10, 1983, interviews were held with employees and consultants to EDC, with the Ford and Carnegie Foundations, with AID and USIA personnel and with various individuals who have been involved with SEPA and SEPA activities. Similar interviews were held in: Botswana, Ghana, Kenya, Liberia, Senegal, Sierra Leone, Uganda and Zimbabwe. Nigeria was included on the itinerary but the interviewer was barred from entering the country. Following is a compilation of the comments from the African interviews. Because so many comments were similar, they have been grouped by issues addressed rather than by country or origin or nationality of the interviewee.

Benefits of SEPA Membership

- Develops people rather than programs
- Involves scientists who are educators
- Is a source of inspiration
- The Science Educators Training Course at Njala
- The International Center for Educational Evaluation at Ibadan
- Networks of people and resources
- Forum for ideas, issues and concerns, coordination of these
- Various workshops
- Teacher Trainers training
- Scholarships, control of quality
- Identification of funding sources
- Group authorship expertise
- Special focus to science and science teaching needs
- Materials and curriculum content
- Ability to get funding for defined efforts
- Program development expertise
- Editing skills

Administrative and Financial Issues

- Funds were squandered
- Infrequent Executive Council meetings
- Communications not timely or frequent
- Secretariat is too expensive
- Countries' dues not paid
- Donor agencies withdrew funding because SEPA seemed mature
- The Executive Secretary was SEPA - both good and bad point
- Ghana is hard to work with for some countries (suggested sites included Ghana, Nairobi, Nigeria, Banjul, and Njala, Sierra Leone)
- Foreign exchange problems
- Is an Executive Director needed?
- Pay for top administrators too high

SEPA Needs

- Professional science educators as administrators
- More checks on accounting procedures
- Regional offices for program and needs monitoring
- Sliding scale for fees, perhaps parallel to O.A.U.'s structure
- More services to countries so as to encourage the desire to pay dues
- Restructuring, better governance and accountability
- Program priorities, published
- Advisory board?
- Activity base (publishing, in-service?) that generates funding
- Tie with an institution or a university
- Keep locally available funds for local support
- On site finance committee for oversight control
- Executive with long term commitment, 3-5 years
- Frequent visits by the Chairman of the Executive Committee
- Program director's salary/honorarium from programs' overhead
- Crediting of local contributions towards country's dues
- More orientation towards practical/useful outcomes from science curriculum, especially environmentally
- Better distribution system
- Develop structures rather than personalities

Needs that Could Be Met by SEPA

- Environmental education materials, sourcebook, teacher training and in-service
- Publication of documents, especially for teacher education; including more copies of existing documents
- Development of book development skills, editing
- New programs in science and technology, rural development, population, energy
- Regional coordination of new program issues and developments
- More science materials, especially kits and low cost equipment
- Assistance with adopting textbooks to the SEPA approach
- Research and technical studies
- Resource center of world-wide innovations and practices
- Further work in African childrens' concept development
- Processes/curricula for out-of-school youth and skills transfer
- Technical assistance in creativity with science and appropriate technology
- Supplementary materials and readers such as in energy, bee keeping - applied sciences
- Guidance for how to go from discovery to utilization and application
- Concept development, use and consequences for mathematics, more integrated mathematics curricula and texts in move towards traditional mathematics
- Approaches for all levels and kinds of teacher training including in-service courses
- Materials development skill training
- Science teacher training at universities
- Evaluation techniques and processes for teaching and textbooks
- New resource people
- Assistance with developing all phases of middle school science; an integrative science curriculum, teacher training materials, etc.
- Science materials for untrained teachers (a la Zim Sci perhaps)
- Development of local materials assembly and distribution capacity
- Revision of A.P.S.P. materials locally
- Improved systems for materials distribution, including publishing
- Center(s) for materials production, with training facilities, printing capacity
- Assistance with the generation of funding for projects and materials

- Master degree program in science education
- Studies on sex differences in learning science and mathematics and the development of materials, including teacher education to reduce the differences
- Pan-African Science Fair, awards for science teaching
- Silk-screened charts and cross-sections for labs
- In-country workshops that can serve as both pre and follow-up ICEE and SETC experiences
- A SETC for Francophone countries, another in East Africa; include health and agricultural science
- Improved numeracy in secondary schools
- Work with academics on problems of teaching their subjects
- Scholarships for SETC and ICEE
- Training in decision making for new administrators

Process for Revitalization of SEPA

With the exception of a few who questioned whether SEPA should be revitalized in the light of costs or in the belief that SEPA had achieved its mission, there was strong agreement amongst the interviewees as to the process of revitalization:

- It should be done by the Executive Committee and the Representative Council
- A small group of two or three should be chosen by the Committee to visit member and potential member countries and interested parties with the objective of finding out the specific needs and supports of SEPA
- The group should present its findings to meetings of the Executive Committee which would then draft recommendations and position paper for the Representative Council. (Some suggested that program directors should be included and invited to a Council meeting)
- The Representative Council should meet on the recommendations and make decisions for SEPA
- The Executive Committee or its appointee(s) should implement the decisions and inform countries and interested parties of the recommendations passed and actions to be taken
- The slate of debts to SEPA and by SEPA should be wiped clean

Special Information and Suggestions

- The Kenya Institute of Education has a science editor on its staff
- Kenya offers a Curriculum Development course, including correspondence work, leading to a Certificate

- Kenya's School Equipment Scheme as model for centralized distribution of materials
- World Bank is sponsoring a Primary Education Project focussed on the practical and relevant in Human Science, Business and Crafts (Kenya)
- ZimSci as model of packaged science program, "teacher proof", includes distance learning materials
- USIA as possible distributor of SEPA materials
- A.C.O. maybe headed for reorganization
- N.E.I.D.A. is interested in supporting, with UNESCO, cooperative work by SEPA, A.C.O., A.S.S.P., BASS, etc.
- E.C.A. is sponsoring a conference in March 1984 in Kano on Cooperation and Coordination in Human Development
- World Bank loan to Liberia includes monies for science and mathematics training in the secondary schools
- British Council is funding a 3 year Core Curriculum in Integrated Science project (Sierra Leone)
- Revised Source Book for Science has just been printed (2000 copies) in Freetown, \$5, with \$4 to go to SEPA's material development fund
- Ghana has excellent copying facilities that are available to SEPA but need grant to repair and maintain the equipment
- UNDP sponsored Council for Scientific and Industrial Research in Ghana would be a site for science equipment manufacture
- Ghana's Book Development Council is good, could have a training course added
- Ghana has prototype (300 copies) materials for science and technology and out-of-school youth which are available for testing

It was hoped that grants could be made directly to SEPA to allow this process to take place. If an outside agency as needed as a pass through for funds, it was expected that such an agency would only provide guidance and support and not run the revitalization process, serving as an observer. Two suggestions were made for venues, one was to have the meetings take place where the next regularly scheduled Executive Committee meeting would have been held: Banjul, The Gambia, or in Kenya where the Chairman is.

APPENDIX 3
PEOPLE INTERVIEWED

SENEGAL

Mr. Andre Lemay	Education Planner	UNESCO
Mr. Cisse	Environmental Ed. Specialist	UNEP
Dr. Boma	Curr. Dev./Ed. Resources	UNESCO
Dr. Alu Ogunniyi	Director	NEIDA
Mlle. Fatou Rigoulet	EHR Officer	USAID
Mr. Norm Rifkin		USAID

SIERRA LEONE

Mr. William Lefes	Director	USAID
Ms. Fay Leary-Lewis	Consultant	USAID
Dr. Udo Bude	Director	DSE
Dr. Mangus Cole	Dir. SciCurr. Center	Njala
Dr. Allieu Kamara	Prof. Science Ed.	Njala
Dr. Awadagin Williams	Prof.	Fourah Bay
Dr. Edmund Cole	Director	Planned Parenthood
Dr. Julius Jonah	Dep. Min. of Ed. (Retired)	Freetown
Mrs. Aislie Lucan	Principal Ed. Officer	MOE
Mr. S. Bundu	Sci.Curr. Dev. Officer	Inst. of Education
Mrs. Palmer	Maths Curr. Dev. Officer	Inst. of Education

LIBERIA

Sr. Rossita Roberts	Dep. Min., Dept. Instruction	MOE
Henry Reynolds	Education Officer	USAID

GHANA

Roy Wagner	Director	USAID
John Thomas	Asst. Director	USAID
Kofi Gyau	Pgm. Trng. Officer	USAID
Mr. Steele	Director	USIS
Mr. Gonzales	Director	US Peace Corps
Mr. R. A. Ntumi	Dir., Curr. Dev.	MOE
Ms. Margaret Tawia	Dep. Dir. Curr. Dev.	MOE
Dr. George Collison	Prof.	Univ. of Cape Coast

Mr. Nyavor Prof. C. Okonjo	Science Organizer Dir., Instit. for Pop. Studies	MOE U. of Ghana
Mr. Walters K. Blege	Dep. Director	Ghana Ed. Services
Dr. Marian Eddy	Prof. Bio-Chemistry	U. of Ghana
<u>KENYA</u>		
Dr. Gilbert Oluoch Dr. Ephantus Mugiri Frances K'Opiyo John Mandu	Dir., Basic Education Chief Insp. of Schools	MOST MOE TTC TTC
Dr. Herbert Kanina Mrs. Kanina Prof. I.M. Omari Mike Savage	Director Primary Education Prof.	KIE KIE IDRC U. of Nairobi
Dr. David Court	Director	Rockefeller Fdn.
Jan Roberts Dr. Sunita Kipella	Math. Specialist Math/Science Researcher	KNEC IDRC
<u>BOTSWANA</u>		
Felicity Leburu	Primary Sci. Curr. Dev.	Head of Ed.
Mr. Hope Phillips Mr. George Makunga Dr. Barnabas Otaala	Chief of Education Officer Curr. Dev. Dean, Fac. of Education	MOE Univ. College
Mrs. Mganunu	Head of Science	
<u>ZIMBABWE</u>		
Dr. Alan Dock	Director	ZimSci Proj.
<u>UGANDA</u>		
Dr. Wandira	Vice Chancellor	Makerere Un.
V. E. Bua R.O. Agwai W. Senteza-Kajubi	Director Asst. Chief Ed. Officer	NCDC MOE
Isaac Jaasi-Kiiza Mathias N. Kibuka Tabaro	Asst. Chief Insp. of Schools Pgm. Asst /Trng. Officer	MOE USAID NCDC
R. Seggalye	Insp. of Schools	MOE

USA

Frank Sutton	Ford Foundation	N.Y.C.
Albert Thompson	TC-Columbia	N.Y.C.
Jill Sheffield	Carnegie Fdn.	N.Y.C.
Kristin Anderson	Carnegie Fdn. (Phone)	N.Y.C.
Jim Washington	AID	D.C.
Hubert Dyasi	S.E.P.A.	Mt. Carroll, Ill.
Malcom O'Dell	E.D.C.	Newton, MA.
Mary Jane Neurendorfer	E.D.C.	Newton, MA.
Renee Williams	E.D.C.	Newton, MA.
Bob Johnson	E.D.C.	Newton, MA.
Ron Israel	E.D.C.	Newton, MA.
Judah Schwartz	E.D.C.	Newton, MA.
Charles Thompson	E.D.C.	Newton, MA.
Chris Hale	E.D.C.	Newton, MA.
Jack Goldstein	EDC/Brandis Un.	Newton, MA.
Ralph Robbins		Newton, MA.
Ross Finney	M.I.T.	Newton, MA.
Janet Whitla	E.D.C.	Newton, MA.
Norman Green	AID/AFR/RA	D.C.
Ralph Harbison	World Bank (phone)	D.C.
Jim Sheffield	US Com. UNICEF (phone)	N.Y.C.
Nathalie Elady-Cole	Wisc. (phone)	

APPENDIX 4

COSTING OF RECOMMENDATIONS

Recommendation #6: Phase 1 of SEPA Revitalization

Executive Meeting - 7 people; 5 days

Airfare	\$6,500
Per diem	2,100
Costs	<u>500</u>

\$ 8,100

Council Meeting - 26 people; 3 days

Airfare	\$24,000
Per diem	4,200
Costs	<u>1,200</u>

29,400

35% Indirect costs

13,125

\$50,625

EDC

Salary (coordinator) 6 mos., ½ time	\$15,000
Salary (secretary) 6 mos., ¾ time	5,250
3 round trips to Africa @ \$1,500	4,500
Per diem for 3 weeks	1,680
Benefits	<u>5,060</u>

\$31,490

Telephone/Telex	\$ 1,800
Office space	500
Copy service	<u>1,000</u>

3,300

TOTAL ESTIMATED COSTS

\$85,415

Recommendation #8: Phase 2, direct support to SEPA, possible grants

1) Repair and supply of copy machine at MOE, Ghana approx. \$ 3,000

2) Fellowships for SETC and ICEE @ \$8,000, 8 per year for five years \$320,000

APPENDIX 4 (cont.)
Costing of Recommendations

3) Secretariat Support		
a) portion of Director's salary for 3 years		\$45,000
b) travel for consulting for 3 years		20,000
c) publishing of <u>Source Book</u> ; 3,000 copies		8,000
d) publishing of <u>Handbook</u> ; 3,000 copies		8,000
e) editing, layout, publishing of environmental science sourcebook; 3,000 copies		15,000
f) publication of APSP units; 3,000 copies		150,000
4) Recruitment of new Director		
Advertisements	\$ 5,000	
Airfare for three candidates	3,000	
Supplies/phone/etc.	250	
Selection Committee meetings	<u>8,100</u>	
		\$16,350

Recommendation #9: Publication and Distribution of SEPA Publications

Publication of <u>Source Book</u> ; 3,000 copies	\$ 8,000
Publication of <u>Handbook</u> ; 3,000 copies	8,000
Development and publication of Environmental sourcebook	15,000
Distribution of above	8,000
Publication of APSP units	150,000

Recommendation #10: Support of development of an SETC in Francophone Africa

1) <u>Planning Meeting on Concept</u>		
15 participants for 5 days, per diem	\$ 4,500	
Airfare, 15 participants	8,925	
Consultant, SEPA/SETC Njala	1,500	
Conference costs	<u>1,000</u>	
		\$15,925
2) If concept is approved: <u>Curriculum Development Workshop</u>		
5 participants, 4 weeks, per diem	\$ 9,000	
Airfare for 2 participants	1,700	
Materials and supplies	<u>500</u>	
		\$11,200

APPENDIX 4 (cont.)
Costing of Recommendations

3) Start up of training program

Director's salary, 5 years, (partial 2 years)	\$ 37,500
2 staff salaries, 5 years, (partial 2 years)	57,000
Consultant services (5 years)	5,000
Fellowships, 6 per year, 5 years, @ \$7,000	<u>210,000</u>

TOTAL ESTIMATED DIRECT COSTS

309,500
\$336,625