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SCIENCE EDUCATION PROGRAMME FOR AFRICA

FINAL REPORT OF THE SCIENCE EDUCATION PROGRAMME FOR AFRICA

TO THE

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

ON

GRANT NUMBER 698-0390

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EXECUTIVE SUMMARY

This report describes science education activities carried out by the Science Education Programme for Africa (SEPA) utilizing funds provided by the United States Agency for International Development (AID) under Grant No. 698-0390 dated June 1976. It also summarizes some SEPA activities funded from other SEPA resources.

SEPA is a regional African organization established in February 1970 to promote excellence and relevance in science education in Africa. In its work, it responds to converging educational objectives emanating from Africa and from other parts of the world. Directed and administered entirely by Africans, SEPA provides scholarships for Africans to study in African universities and implements a science education approach that is learner-focused and based on problem-solving and inquiry approaches.

SEPA's origins are related to earlier attempts by the U.S. Agency for International Development to assist accelerated development of African education generally and of science education in particular. In the 1960's most of that assistance took the form of scholarship awards to African students to study in American colleges and universities, expansion of African educational facilities, provision of technical assistance and staff to develop educational institutions at national levels, and exportation of American approaches to curriculum development and teacher education. The AID grant to SEPA does not, however, fit in any of these categorizations.

AID's grant No. 698-0390, the subject of this report, became operative in July 1976 and ends in December 1981. Prior to this period SEPA had administered a very modest 2-year AID grant to develop teacher education materials and to run its Secretariat in Ghana. Simultaneously, SEPA worked collaboratively with Education Development Center (EDC) of Newton, Massachusetts on an AID-funded implementation phase of a primary science education programme in Africa. Near the completion of the EDC contract in 1975 a two-man team of American science educators selected by the overseas Liaison Committee (Washington, D.C.) reviewed SEPA activities and recommended financial support directly to SEPA. A detailed funding request had already been submitted by SEPA to AID. In response, AID made an initial 3-year grant of $360,000; the grant was amended a few times later to bring the total AID financial commitment to $749,576 and the completion date to December 31, 1981.

Through grant No. 698-0390, AID sought to assist SEPA extend the educational benefits of a problem-solving environmental science education to schools and colleges in African countries with a combined population of well over 100 million people. Specifically, AID funds would enable SEPA develop science teacher education materials, conduct annually a nine-month resident science educators training course, and introduce non-formal education activities focusing on rural youth. The funds would also assist in the dissemination of developed science education ideas and materials and in the employment of consultants to assist SEPA in project implementation. In addition, AID funds would be used to strengthen SEPA administration.

All the grant supported activities have been carried out successfully. The project for the development of teacher training materials assembled a team of very able African educators and produced a Handbook for Teachers of Science, a Sourcebook for Science Teachers, six Monographs on science education topics, produced and tested designs of low-cost equipment, prepared a repertoire of completed scientific investigations carried out by secondary school students, and prepared several charts on selected science topics. Except for the Handbook which has undergone revision, all these materials are available in limited quantities for trial usage. Communication difficulties among African countries and shortages of raw material such as paper delayed full dissemination of these materials. Future work on this project would involve discrete activities such as commissioning of authors to write an environmental science education book and production of a Handbook adopting the SEPA approach for lower secondary school classes.

The resident science educators training course has been run successfully every year, training altogether over 80 science educators from 16 African countries. The majority of the trainees have been teacher educators, curriculum developers, and organizers of in-service teachers workshops. Graduates of the course play leadership roles in education development in their countries; they have been responsible, in many cases, for the adoption of the SEPA approach and science education materials. External reviews of the course confirm that it fulfils a compelling need and that it is ably run. Its expansion, however, is hampered by limited physical facilities at Njala University College. The inclusion of teacher educators in environmental studies, languages, mathematics, and agriculture has been proposed. A parallel course for Francophone countries in Africa is planned.

A completely new activity for SEPA - the education of out-of-school rural youth - has been carried out successfully. Planning activities have been implemented and appropriate non-formal education institutions with which to associate SEPA activities have been identified. Apart from developing a conceptual research and evaluation model, seven manuals designed for use by leaders of out-of-school education programmes have been developed. All the manuals still have to be trial-tested on a large scale, and it will be during the trial phase that a review of the project will be meaningful. Leadership training workshops have been conducted using manuals developed under the project as training materials. The SEPA approach, and materials embodying it, have been disseminated in curriculum development centres and teacher training colleges. Also, an information package on SEPA has been assembled and consultants have been employed to help nationals use it during workshops. Graduates of SEPA training programmes play key roles in these dissemination activities.

The grant funds have enabled SEPA set up an effective and efficient administration. Due to AID support in the organization of early SEPA governing council meetings, SEPA has increased its membership and, therefore, its income from that source. Earlier, AID support of staffing requirements enabled SEPA 'save' on membership dues in order later to support its Secretariat entirely from its own resources.

Apart from activities supported from the AID grant, SEPA has been able to marshal support from private Foundations, European and British counterparts of the U.S. Agency for International Development, and from specialized U.N. agencies. From these additional bodies SEPA obtained funds for training programmes in educational evaluation and research, for materials development in environmental science education, and for the popularization of its approach to science education.

The effects of the AID grant and of other donors' have given SEPA needed visibility and credibility within Africa and internationally. They have enabled SEPA receive coveted recognition in the Organization of African Unity, individual African nations, the United Nations family, and in the United States.

In its desire to assist in social change through education development in Africa the U.S. Agency for International Development, it is suggested, should not let its resource availability to SEPA wither away - and render meaningless its past and present assistance to regional efforts in education development in Africa.

CHAPTER 1

GENERAL BACKGROUND

The Science Education Programme for Africa (SEPA) was established in February 1970 by educators from nine English-speaking African countries. They had met in Freetown, Sierra Leone, to devise ways and means of continual improvement of science education in Africa. It was conceived as a regional mechanism for participating countries to work cooperatively to promote relevance and excellence in African science education in particular and in education development generally. At the time SEPA was formed the Agency for International Development (AID) in Washington, D.C. was furnishing funds for the development and implementation of an African Science project generally known as the African Primary Science Programme (APSP). The Education Development Center (EDC) based in Newton, Massachusetts had been selected by AID as the Programme's implementing institution.

Responding to requests by representatives of African countries in 1970, EDC requested and obtained permission from AID to use some of the funds allocated to the African science project, to develop SEPA. Later, when EDC and AID entered into a new agreement on the African science project in 1971, the contract made specific provision for assistance to SEPA. The assistance was mainly for the organization of meetings of SEPA's governing body (or Representative Council) and of its Executive Committee and for the employment of an Executive Secretary. The contract also made provision for limited support of other staff and of some administrative expenses. Specifically, the contract mandated EDC's "support to the Science Education Programme for Africa (hereinafter called SEPA), an African based and directed organization which will ultimately assume complete responsibility for leadership and coordination of African science programme".[1]

With this initial funding assistance, SEPA soon developed its capability in programme design, management, and implementation. It also acquired a capacity to draw financial and professional support from African governments, British government agencies, specialized agencies of the United Nations, and from private Foundations. In 1971, for example, SEPA organized, conducted, and produced reports of a four-week science teacher educators workshop. Over 50 people from Africa and the United States participated in this unique event in African science. Then in 1972 SEPA designed, planned, and implemented a six-month resident training course for science educators, curriculum developers, and teacher supervisors. Also in 1972, SEPA obtained funds from the Carnegie Corporation of New York to establish a research, training, the contractual programme in educational evaluation. Start-up funds for administration were received from the British Centre for Educational Development Overseas.

AID funds were used to establish a Secretariat for SEPA. After initial efforts to locate it at Njala University College in Sierra Leone proved unsuccessful, it was established in Accra, Ghana. The Secretariat prepared a constitution which was discussed and agreed upon after several meetings of SEPA's governing bodies (the Representative Council and the Executive Committee). When three African governments formally accepted the constitution in 1972, SEPA gained full juridical personality as a non-profit institution.

The Instrument of Acceptance submitted by countries upon joining SEPA made specific recognition of the contributions of the AID-funded African Primary Science Programme as SEPA's forerunner. It also made reference to the need for African countries to support science education improvement at all educational levels in Africa.

The constituent document of SEPA described SEPA as an autonomous institution that can formulate its own policies, rules, programmes, and regulations. In this regard the Attorney General of Ghana wrote inter alia in an advisory opinion:[2]

> Article IV [of the SEPA Constitution] explicitly vests the Organisation with juridical personality, including capacity to contract, to acquire and dispose of immovable and movable property and to institute legal proceedings. Hence once the Constitution has entered into force, SEPA as an international organisation is endowed with juridical personality on the international plane and it is, ipso facto, competent to transact business within the framework of its Constitution.

SEPA consists of a policy-making Representative Council drawn from its Member countries. From among its members, the Representative Council elects an Executive Committee to oversee the implementation of SEPA projects. A small and efficient Secretariat serves as the nerve centre of all SEPA activities and is under an Executive Director who must be the best qualified and most experienced science educator in Africa.

Having full juridical personality as well as support from a number of African governments, in 1974 SEPA requested a grant from AID to prepare teacher training materials in science education. A grant agreement authorizing usage of $42,100 from AID was duly signed. It provided financial support for the employment of an Executive Secretary (later designated Executive Director), the development of teacher training materials and for a part-time project director. The grant covered a period of twelve months beginning July 1, 1975 but was later amended to cover twenty-seven months. AID's confidence in SEPA was based on the latter's demonstrated maturity in programme management.

Under an operant EDC/AID contract, SEPA was responsible simultaneously for the continuing implementation of the African science project funded by AID through EDC. It was also administering a grant of $200,000 from the Carnegie Corporation. Concurrently SEPA was collaborating with UNESCO on the introduction of integrated science education in Francophone African countries and on the formulation of a framework for research studies on child development in Africa. In addition, SEPA was responsible for organizing, conducting, and documenting environmental education activities in English-speaking and then in French-speaking African countries through support from UNICEF and from the United Nations Environment Programme (UNEP) respectively. Even early in its existence, therefore, SEPA had quite a few very important responsibilities.

Factors leading to the Grant

The 1974 grant agreement between SEPA and AID initiated a successful partnership between SEPA and the government of the United States of America in science education development. That partnership gained strength in 1975 and 1976. In 1975, following extensive consultations with African education officials and then with AID staff, the Executive Director of SEPA prepared a comprehensive statement on science education priorities and resource needs in Africa. The statement included a description of appropriate responsive action and funding levels regarding a resident science educator course, development of materials for teacher training, science education for out-of school youth, and evaluation activities. Prepared in accordance with AID's project logical framework, the statement formed a basis for continuing funding of SEPA by AID.

A pivotal factor in the development of the SEPA/AID partnership was AID's decision to send a team in September 1975 to review SEPA's capabilities as an implementing institution and its capacity to carry out the projects it had proposed. A two-man team selected by the Overseas Liaison Committee of the American Council on Education conducted the review in West and East Africa. Among the conclusions reached by the review team was:[3]

> SEPA is one of the most successful enterprises of its kind. Similar attempts in other subject areas (eg. math) have not succeeded in achieving the level of support, prestige or effectiveness that presently characterizes SEPA. With full recognition that it is not in the business of producing a "continental science curriculum," it has encouraged innovation and local adaptation, while at the same time enhancing the role of the Ministries as well as that of the classroom teacher, SEPA has also demonstrated its ability to recognize new directions in which it may assume leadership... SEPA merits support particularly for its new activities from as many sources as possible.

The review team specifically recommended funding for the proposed development of teacher training materials, science educators training course, a new staff position of programme specialist (programme director) and for some administrative aspects such as a meeting of the SEPA Representative Council and Council follow-up activities. The team also concluded that the "SEPA staff functions efficiently and effectively ... SEPA appears able to meet its commitments. The support received from member nations, USAID and foundations appears to be utilized well and increasing ... In general, the SEPA administration is excellent at this point ... the structure exists for sound fiscal policies and practices, good management, and an ability to meet commitments."[4] Even as it made these statements, the review team was somewhat apprehensive about impending leadership change at the SEPA Secretariat, but hoped it would not affect SEPA's efficiency and effectiveness.

In 1976, AID decided to give substantial funding support to SEPA. The demonstrated effectiveness of SEPA in grant and project management and implementation during 1970-75 was a primary factor in AID's decision. A second factor was SEPA's pursuasive perceptions of programme and resource needs for science education improvement in Africa. Finally, there were the compelling findings and recommendations of the 1975 review of SEPA.

CHAPTER 2

MAJOR PARAMETERS OF THE GRANT

Having studied the request for funds by SEPA, and aware of the recommendations of the external review team of November 1975, AID responded positively to SEPA's request. A grant Agreement accordingly was prepared by AID and later signed by the Director of the USAID Mission to Ghana and by the Executive Director of SEPA.

Grant Objective

The grant Agreement stated that the purpose of the grant was to provide financial and other assistance to SEPA to carry out a Project for African Science Education. It specified that [5]

A. The purpose of the Project is to improve the capabilities of certain African countries, through their membership or association with SEPA, to design, implement, and evaluate science education programs which are relevant to African development.

B. Activities under this Project shall consist of the following:

1. Development of Teacher Training Materials.

The Grantee will plan and conduct in-country writer workshops to develop science education materials to be used in teacher training schools. From one to three workshops will be conducted annually. African resource experts working regionally will assist with selected workshops. Workshop participants will develop, and/or adapt science source books, monographs, readers, background booklets, and other suitable science teaching aids for in-country use at teacher training institutions

2. Resident Training Courses.

The Resident Training Course at the Njala College Sierra Leone, will be institutionalized. SEPA will plan and conduct nine-month training courses annually at Njala for as many participants as facilities, staff and funds will accommodate.

3. Non-Formal Education for Rural Out-of-School Youth

A planning meeting of 13-15 participants will be planned and conducted for the purpose of identifying and designing non-formal education activities in such areas as agriculture, health, and resource utilization for out-of-school youth (ages 8 through 18). These activities will

be designed to assist the participating youth understand the scientific phenomena of their environment. A number of materials development workshops will be conducted to design courses of study and to develop instructional materials and aids necessary for teaching these non-formal education courses.

4. Strengthening SEPA Administration and Organization.

The amounts allocated for each item are shown in Figure 1.

Figure 1

MAJOR ITEMS OF AID GRANT TO SEPA 1976-1981

ITEM	FISCAL YEARS					
	76	77	78	79	80/81	TOTAL
SECRETARIAT	40,977	45,032	49,108	35,683		170,800
MATERIALS DEVELOPMENT	1,532	6,755	21,380	-		29,667
TRAINING COURSE	4,841	61,312	60,552	64,053	59,160	249,918
OUT-OF-SCHOOL PROJECT	18,650	14,391	35,470	49,640	92,265	210,416
DISSEMINATION	-	-	-	15,200	51,575	66,775
CONSULTANCY	-	-	-	-	22,000	22,000
TOTAL	66,000	127,490	166,510	164,576	225,000	749,576

Briefly then, (a) the teacher training materials development project aimed at improving teacher education materials for teaching science and at distributing them to SEPA member countries; (b) the resident training course was to train science educators, evaluators and curriculum specialists in the SEPA methodology; (c) basic environmental science education in agriculture, health and resource conservation would be provided to out-of-school rural youths through the out-of-school science education project. The common goal of all the project activities and of assistance to an efficient and effective

SEPA Secretariat was to provide the populations of select African countries with a more relevant basic education in science in its broadest sense.

The grant sought to benefit Africa in three ways. As the initial beneficiary, SEPA would continue to refine and expand its capacity to develop appropriate science education materials and to train educators and evaluators from its member countries. Intermediate benefits could accrue to Members of SEPA who would receive the improved education materials and cadres of trained science educators, evaluators, and curriculum specialists. The ultimate beneficiaries would, of course, be the primary school age and out-of-school youths who would study under the new curricula.

CHAPTER 3

TEACHER TRAINING MATERIALS DEVELOPMENT

Background

Like its predecessor's, the African Primary Science Programme's, one of the major operating premises of the Science Education Programme for Africa has been that its activities must always incorporate an active development component. This component would not only help maintain vitality in all SEPA's programming activities, but would also sustain the interest of science education specialists in SEPA's work. Further, experience in the APSP had shown that participation in the developmental phases of the programme was the best means of inculcating the professional skills needed in the dissemination of the problem-solving approach in science education.

The selection of teacher training materials as one of the foci of SEPA's development activities was based on evidence from several sources. The professional staff of the SEPA Secretariat and science educators in several African countries had observed that while the APSP units were excellent aids in the teaching of science, they were inadequate when used without alteration in teacher training colleges. Tutors in the colleges needed materials which explained and illustrated the inquiry and problem-solving approach to learning in more detail than the units did. Deficiencies in tutor (or teacher training college lecturer) preparatory programmes regarding the "new approach" to science teaching also contributed to the need for the development of materials that were especially suitable for use in teacher training college. Evidence of deficiencies in tutor training programmes was furnished by teacher educators in the various countries associated with SEPA. It also came from observations by SEPA Secretariat staff during their consultation visits to SEPA member countries.

Further evidence of deficiencies in tutor preparatory programmes and, therefore, of the need for the development of teacher training materials was expressed forcefully at a Workshop on the production of teacher training materials. The 51 participants at the Workshop held in Kenya in 1971, came from 14 African countries and from the United States of America. During their four-week stay together it became apparent that there was considerable variability in professional backgrounds of tutors in different African countries. Consequently, following the Workshop a group of science teacher educators met in Accra, Ghana to consider an appropriate programme response. The group re-iterated the deficiencies perceived by the participants of the 1971 Workshop. They highlighted SEPA's responsibility to provide, within the limits of its capabilities, whatever the member countries needed in the development of science education materials for teacher training. That responsibility would facilitate an early realization by member countries of their goals and objectives of teacher training within the context of problem-solving and inquiry-based science education.

The group also drew attention to an observable shift in many African countries from an emphasis on in-service teacher education to a renewal of pre-service teacher preparatory programmes. Accordingly, the main focus of activities had shifted from the teachers in the field to the tutors who train the teacher. The shift did not, however, reflect a diminished role of in-service teachers in education development, but a desire to complement the gains already made in in-service teacher education.

Cognisant of the needs of African countries in pre-service teacher education and of the widely differing professional backgrounds of teacher training college tutors, a 1972 meeting faced the task of reconciling the need for differentiation in SEPA's response with SEPA's sense of the importance of regional activity from which all SEPA members could participate. "The solution ultimately reached," wrote Ralph Robins of EDC, "was an ingenious compromise: preparation of background materials in science and science education which would support individually tailored national programmes but would not constitute courses in themselves."[6] Thus the teacher training materials development project was established.

Objectives

The major objective of the project has been the development of a number of written materials for tutors, curriculum developers, and teachers. The materials were designed to:

1. explain the philosophy of the SEPA approach to science learning and provide concrete examples of its successful application in teaching/learning situations involving young children as well as those involving teacher training college students;

2. develop a step-by-step procedure for writing units of work involving children in the study of their environment;

3. give teachers an understanding of how children learn and the role of the child's intimate culture in the learning process;

4. deepen the knowledge of teachers in specific aspects of the SEPA approach and acquaint them with relevant science education literature;

5. serve as a bank of ideas for preparing teaching units and as a guide to sources of information and physical materials for improvising science teaching equipment.

Two subsidiary objectives were identified as the exploration of the possibility of producing charts as teaching aids and the introduction of the written materials in workshops organized at the national level. The purposes of introducing the materials in national workshops were to lay a foundation for their dissemination and to stimulate each country to develop materials which would meet its specific needs while retaining the problem-solving and inquiry approach characteristic of materials developed by SEPA.

Rationale

The objectives of the teacher training materials development project were formulated after consideration of three factors, namely, the problems of tutors, teachers, and pupils; the necessity to present science concepts in greater detail; and the need to integrate an inquiry-based educational approach with basic science concepts. The problems of tutors were related to (a) lack of self-confidence due to either inadequate familiarity with basic science concepts or the inquiry approach to learning or to both; (b) non-availability of science teaching materials especially suitable reference books and audio-visual aids; (c) difficulties in bringing about attitudinal changes in college students; (d) lack of experience in initiating curriculum development in teacher education.

Problems facing teachers were those of the tutors writ large. In particular, however, teachers suffered from lack of confidence, conviction, and expertise. Lack of confidence comprised poor self-confidence, little confidence in children's ability to learn enough through the inquiry approach, and social pressures arising out of parents' perceptions of science as a body of facts or of generalisations to be memorised. The problem of conviction centred around the need for the teacher to become convinced that the inquiry approach is worth the time and effort involved in its use in the classroom. Teachers had to be convinced of the feasibility of the approach, its immense benefits, and of its intrinsic worth in the wider context of human resource development. Among the problems associated with expertise were the development of skills in questioning, experimental design, basic science procedures such as making accurate observations and keeping records, and fluency in conducting classroom transactions permeated by a spirit of inquiry.

Schoolchildren faced problems of learning in a foreign language, suppressed initiative as a result of learning under authoritarian teachers, and of pressures imposed by the need to prepare for external examinations.

An understanding of basic science concepts integrated with education is useful in broadening the perspectives of tutors and teachers, in enriching learning, in guiding the learner along fruitful lines of investigation, and in helping the teacher recognize and correct false conclusions reached by the learner. Acquisition of scientific concepts by the teacher can assist in deepening the interest of the learner, providing both depth and breadth that promote confidence in carrying out investigations with uncertain outcomes. A minimum amount of scientific knowledge can also provide a stimulus for further inquiry and reduce the time needed for planning and carrying out science learning activities.

Plan of Work

To achieve the stated objectives, SEPA was required to select a part-time director for the project. He/she would assist the Secretariat in implementing the project generally and in selecting suitably qualified material developers in particular. The plan of work also specified the following activities:
(1) conduct of a planning and needs identification workshop; (2) organization of production workshops at the regional level; (3) recruitment of volunteers to write monographs;

(4) printing and distribution of written materials; (5) conduct of in-country workshops to introduce and disseminate written materials embodying the inquiry approach to education.

SEPA added a set of guiding principles to the plan of work. Among the most important were the following:[7] (a) the critical area of support is at the level of interactions between the college tutor and pre-service primary teachers; hence the materials must address the problems faced by the tutor, the teacher, and by schoolchildren in the learning of science; (b) an integrated science strategy for achieving the objectives would be adopted; (c) the materials developed should be flexible enough to stimulate teacher trainers, teachers, and curriculum developers to meet specific science education objectives of their countries; (d) SEPA materials would enable users develop their own materials relating to their environment, topics in the syllabus, and to their classroom activities and discussions; (e) the materials would highlight key science education problems and offer illustrative ways of solving them on the basis of successful efforts.

Target Groups

The teacher training materials would address themselves to the following groups: (a) tutors in primary teacher training colleges; (b) teacher training college students; (c) in-service teachers; (d) in-country resource people, and (e) educational administrators.

Each of these groups is important in its own right in the dissemination of educational ideas and practice. The tutors for example are a significant multiplier factor by virtue of their activities as trainers of young future teachers; the college students become another multiplier factor by reason of their subsequent substantial reach to, and contact with large numbers of elementary-school children, and that is true of experienced in-service teachers as well. As decision-makers regarding selection of suitable resource materials and texts for use in their country's elementary schools, educational administrators are important gatekeepers in the dissemination of new ideas within the education system. In-country resource staff, like other professionals generally, need excellent state-of-the-art professional tools.

An attempt to develop materials for apparently diverse groups might appear ill-advised. And it would be, except that in many African countries these groups had similar problems, e.g. insufficient background knowledge of science and science education, inadequate familiarity with learner-focussed inquiry and problem-solving approaches in education, and a scarcity of quality materials representative of sound practice in the integration of science and of science with the learner's intimate environment. It seemed wise, therefore, to use problem areas as well as different groups of educational personnel as bases for deciding on the kinds of materials to be developed. This approach was in line with SEPA's desire to avoid developing a continent-wide curriculum and with SEPA's perception of itself as a problem-solving institution.

Project Achievements

The Teacher Training Materials Development Team

To implement the project, SEPA selected Prof. D.E.B. Chaytor of the University of Sierra Leone as part-time director. Professor Chaytor is not only a distinguished Zoologist but also an outstanding science educator who played a leadership role in the development of the famous teacher education and agriculture programmes of Njala University College. He had been associated directly with APSP and SEPA activities since 1966. In August 1979 he assembled a team for the development of teacher training materials consisting of:

Prof. D.E.B. Chaytor (Chairman)	:	University of Sierra Leone Freetown
Marian E. Addy	:	University of Ghana, Legon
J.W. Alexander, Jr.	:	USAID, Freetown
R. Botchway	:	Science Unit, Accra
H.M. Dyasi	:	SEPA Secretariat, Accra
A.I. Kamara	:	SEPA Science Educator Njala University College
Prof. E. Laing	:	University of Ghana, Legon
I. Odoi	:	Science Unit, Accra
R.O. Chuche	:	University of Nigeria, Nsukka
M.B.R. Savage	:	Kenya Institute of Education, Nairobi

All these outstanding science educators had had a long association with SEPA and its work. They, therefore, brought with them a wealth of experience and a knowledge of the needs of science tacher educators and of science teacher.

Production of Materials

Three writing workshops were held: (a) 25 August to 4 September 1976 in Accra, Ghana; (b) 28 December 1977 in Accra, Ghana; (c) 15-20 March, 1977 at Njala University College. Revision and editorial work was carried out also when some of the team members met during workshops organized for other projects.

During 20 November to 12 December, 1977 Professor Chaytor visited a number of African countries to assess their needs with respect to in-country workshops for the dissemination of written materials. Apart from promotional activities, he explored facilities for the distribution of SEPA materials. The countries visited were Botswana, Lesotho, Liberia, Kenya, Seychelles, Swaziland and Zambia.

Six kinds of materials were produced by the team, namely, a Handbook, a Sourcebook, Monographs, Equipment Designs, Charts, and Individual Students Investigations.

Work on the Handbook for Teachers of Science had been started under an earlier grant from AID. Over five hundred copies had been printed and distributed to participating countries for trial usage. As a result of feedback, minor revisions were made using funds from the current grant.

After revisions were made, the Handbook was printed by the Far East Press of McGraw-Hill. Ten thousand copies of the 138-page volume were printed and shipped to distributors in Nigeria and Kenya for further distribution and for sale from those points. Distributors were identified in Swaziland, Uganda, Zambia, and in several other African countries. The demand for the Handbook is very high and there are insufficient copies available. The demand is especially high in those institutions staffed by graduates of the science educators training course.

The Handbook is divided into six sections. The first section gives an illustrated description of SEPA's philosophy of the activity approach to elementary-school science education. Detailed "case studies" of training college students doing science in consonance with the SEPA philosophy are presented in section two. Section three provides experimental activities and related readings on science topics found in most curricula for teacher training colleges. In sections four and five case work on children learning science the "SEPA way" is presented. Skills and techniques of relating children's idiosyncratic ways of interacting with, and interpreting phenomena are treated. The Handbook concludes with strategies for designing instruction, assessing children's progress, improving questioning and inquiry techniques, and for keeping records of learning activities. The Handbook has been praised very highly by curriculum developers and by teacher educators alike as an excellent book. It is written in simple and straightforward language.

Similarly a Sourcebook for Science Teachers was written. Limited quantities (750 copies) were printed for trial usage. After feedback was received, it was revised. The printing of five thousand copies of its final version was contracted to the government printer in Freetown, Sierra Leone. The 139-page book combines scientific and pedagogical principles in an integrated manner. It is divided into sections dealing in concrete fashion with the process of scientific inquiry, thinking and learning, a scientific look at the environment, the building and utilization of science teaching resources, and with sources of information and of materials. The sourcebook is unique in other respects too; it is tailored specifically for teachers working under difficult conditions and very often in isolation; it addresses itself to the problems of helping young people develop capabilities to master and use science in their life activities; and it presents in a stimulating fashion an integrated study of science through activities that the learners perform, discuss, think about, and suggest. In other words, it is an excellent document on the SEPA approach to science education.

A series of Monographs was planned as part of the materials development effort. The monographs were readings in science and science education designed to improve understanding and strengthen capabilities in the methods, philosophy, and the psychology of learning science by inquiry and problem-solving approaches. The background information provided by the monographs would be particularly useful for tutors and curriculum developers.

As the preparation of monographs progressed it became clear increasingly that they might represent too great a departure from actual classroom issues and from the problems of primary school teachers and pupils. An emphasis on them could portray the project as too academic and irrelevant to teachers' needs. Consequently, the production of monographs was pursued with less than maximum enthusiasm. Nevertheless, six monographs were completed.

The materials development team also developed a series of mini-projects for use by secondary school or teacher training college students. The mini-projects give students firsthand experience in carrying out scientific investigations under minimum supervision on phenomena that are familiar to them. From such experience students would catch some of the intellectual and emotional excitement of doing inquiry science; consequently, they would develop a deeper understanding and liking of science activities. Among the mini-projects are: (1) investigations into phenomena of water loss from natural systems; (2) how much power does a muscle generate? (3) ecology of selected animals; (4) pollution of beaches;' (5) map-making; (6) constructing and using a globe; (7) making a battery; (8) termites; (9) colour varieties of flowers; (10) chemically useful plants.

Many APSP units contain designs of useful equipment for primary-school science education, e.g. designs for the construction of magnifiers, microscopes, and of general shop tools. The materials development team recommended the compilation of these designs into a handbook for making low-cost science equipment for primary schools. They added other designs such as a wormery viewing box, linear expansion apparatus, steam driven turbine, equalizer scale, and numerous others. All the designs require only simple, local and inexpensive materials; they work very well.

Production of charts was undertaken late in the life of the project. The materials development team felt that SEPA should produce teaching charts instead of diagrams. A teaching chart would be a 'unit' consisting of (1) a set of charts illustrating a topic; (2) notes on the use of the charts; (3) background notes on the topic (including scientific and social components); (4) references; (5) suggested reading material; (6) discussion questions; and (7) suggested projects and activities. The teaching charts would be prepared by Professors D. E. B. Chaytor and E. Laing and would be suitable for teacher training colleges and secondary schools. The topics covered are Bilharzia, Malaria, Water Cycle, Sunlight, and Pond Life. The charts will be reproduced on cloth and on paper.

Reflection

The successful development and production of SEPA materials has enhanced SEPA's visibility immensely. The materials portray SEPA as a living, active, and viable institution. Their educational usefulness and high quality evident from the very early stages of their design led Benjamin and Koran to predict that the Handbook and the Sourcebook "will have a decided impact on the nature of science teacher training."[8] The large number of requests received by the Secretariat for these books is testimony to a great demand for them. As a result of their use by graduates of the science

educators training course, they have spread widely and reached many teacher training college tutors and curriculum developers. Their high quality has been attested also in workshops of international scientific organizations. Most recently in April, 1981, they were cited at a Paris Workshop of UNESCO and the worldwide federation of scientific unions - the International Council of Scientific Unions.

The laudatory statements on these materials are further proof that African scholars can become deeply engaged in efforts to improve primary education in Africa. The essential ingredients for their successful mobilization are a congenial working environment and appropriate incentives.

Production of materials, however, is plagued by three serious problems - editorial work, printing, and distribution. There are just not enough appropriately trained African editors who can devote their skills to materials on inquiry science education. In the long run, it was the part-time director of the project who edited the manuscripts. The monographs were scarcely edited. The problems of printing and distribution are part of the general problem of under-development. There were long and numerous delays in the printing. In some cases advance payments were made to enable the printers purchase needed supplies. After printing, books took a long time to reach their destinations due to poor freight services among African countries. Consignments remained for months at the port of origin.

Desirable Future Activities

Science curriculum development centres are now in operation in most African countries. Most of them were developed with assistance from AID. Although still understaffed, they develop curriculum materials to serve as companions to those produced by SEPA. SEPA can be most helpful to the Centres and also enhance its own image in African countries by providing short-term resource persons to assist local staff develop their national curriculum materials in line with SEPA's approach. It is most desirable to provide this assistance while graduates of the science educators training course are on the staff of the Centres. Similar assistance can be given to science teachers associations which, in many cases, produce science education materials for their members, publish periodicals, play leadership roles in workshops for in-service teachers, and organize and adjudicate in science competitions. They are a most legitimate and effective channel for propagating science teaching ideas.

There is need now for different kinds of materials and for a different mechanism in their development. New materials need to focus on practical environmental issues and the applications of science to them, manuals on the production of science books, and on science books for junior secondary school pupils.

Pressing practical environmental issues in Africa include food, water, energy and population. A fundamental broad-based understanding of these issues is needed urgently to prevent further environmental degradation. A necessary component of that understanding is the use of scientific knowledge and principles in conservation education and in the proper management of resources. Traditional methods of environmental protection would also be

included in the study of the environmental issues. Already, some of these issues are included in high school and college syllabuses, but teachers and lecturers have no resource materials on them. Useful materials on the issues would incorporate lessons on productivity and self-reliance in food production, energy conservation, water purification and in prevention of environmental deterioration.

There is severe scarcity of trained science book producers in Africa. This is true in all phases of book production, namely writing, editing, design and layout, printing, and distribution. The scarcity of knowledge is evident also with regard to pricing, copywriting, and administration of royalties. A useful initial SEPA response would be preparation of simple manuals to be used by trainers. Later, it might be desirable to establish or support training programmes on science books production.

The junior secondary school is the most neglected educational level in African curriculum development. Most secondary school science books are suitable for the senior classes of the secondary cycle of education. Yet the junior secondary school serves larger numbers than the senior secondary classes and provides a basic education for students destined for teacher training colleges, senior secondary classes, technical schools, nursing, and numerous other middle level careers which require basic knowledge of science and of its applications. At present junior secondary school pupils are taught watered-down senior science courses. The materials development project could develop appropriate ecology-based books for this level.

The mechanism of using occasional workshops to develop teacher training materials has not proved completely satisfactory. It is unrealistic to expect scholars to rid their minds of the demands of their regular work and concentrate on writing SEPA materials in two weeks away from their usual working environments. An alternative mechanism may be to commission authorship of manuals. Two workshops would be necessary, a briefing or orientation workshop of all authors at the beginning of a project and a final or concluding workshop after the authors have completed their writing assignments. This alterantive would not have worked well earlier when there were much fewer authors familiar with the SEPA approach to science education.

Concluding Remark

This project for the development of teacher training materials has achieved a lot; the supportive role of the produced materials is well-appreciated among SEPA's member countries. SEPA will build upon the experience accumulated in the implementation of the project to develop other kinds of materials.

CHAPTER 4

SCIENCE EDUCATORS TRAINING COURSE

Background

As in the case of the project for the development of teacher training materials, recognition of the need for intensive training for science teacher education personnel grew out of earlier programme work. The establishment of curriculum development centres was the cornerstone of the APSP programming activities. But these centres suffered from acute shortages of suitably trained manpower. Although in the early 1970's some Africans had studied science education abroad, their numbers were small, they were widely scattered, and their training had not always been relevant to African needs. It seemed prudent, therefore, to find a way to increase the numbers of trained science curriculum developers and simultaneously to provide them with training opportunities that would meet their needs in their countries.

Earlier programme activities in science teacher education had revealed a dearth of teacher training college tutors and in-service workshop organisers conversant with the problem-solving and inquiry approach to science education. During SEPA Workshops for science teacher educators, and for organizers of workshops for in-service teachers during 1970-75, it became increasingly clear that these groups had only casual acquaintance with science education methodology. Consequently in 1974 the SEPA Secretariat held extensive consultations with member countries on the state of science education in the primary teacher training colleges. From the consultations the Secretariat learned that the pool of science tutors in primary teacher training colleges ranged from primary school teachers who had gained promotion on the basis of long experience as teachers in the education system to people who had a bachelor's degree in a science and a one-year diploma in education. Practically all the tutors had not studied science education during their training. Some had inadequate training in basic science as well but were familiar with primary school classroom situations by virtue of their long experience as primary school teachers. Others had a general knowledge of scientific facts but lacked knowledge of principles and methodologies of science education theory and practice. Similarly most curriculum developers and organizers of workshops for in-service teachers were unfamiliar with the field of science education, and in many cases with science as well.

Further evidence of a need for a special science educators training course came from other sources. Several African countries had held national workshops for tutors and supervision personnel. The duration of the workshops varied from a few days to two weeks and in some cases to four or five weeks. The workshops, led by resource persons provided by SEPA and by the host country, provided training opportunities for in-country personnel in the inquiry approach to science education and its incorporation in teacher education programmes. While the Workshop experiences succeeded in creating enthusiasm for the approach, they were not of sufficient duration or depth to enable the participants to internalize the skills and knowledge required to implement the approach in their professional activities. A longer and more intensive course was therefore necessary.

During subsequent consultations between the SEPA Secretariat and members of SEPA it became very clear that the quality of the tutor in the teacher training colleges was the weakest link in efforts to introduce inquiry science education in the primary teacher training colleges. The same conclusion had been reached in 1972 by a group of science education specialists and tutors who had met in Accra, Ghana, to help the Secretariat design an appropriate programme response to the need to implement the "new science education" in pre-service primary teacher training programmes.

The identification of the tutor as the weakest link in the chain of science education improvement contributed to a growing awareness of serious shortcomings in teacher educator programmes in Africa. The few existing teacher educator programmes had a strong academic orientation characterized by a concentration on furnishing students with basic scientific facts. When offered, professional studies in science education comprised a very small portion of the programme and were overshadowed by theoretical considerations of philosophical and psychological foundations of education. In effect, there were no residential tutor education programmes geared to the implementation of inquiry oriented science education.

It was no surprise, therefore, that even though the APSP units had been prepared and were available in most member countries of SEPA, there was limited direct implementation of inquiry approaches in primary teacher training colleges and in workshops for in-service teachers. There were not enough science education tutors in the colleges or enough workshop organisers and supervisors in the education system who were sufficiently familiar with the inquiry approach to implement it. Indeed, an investigation in 1975 of the perceptions of science by teacher training college students and by their tutors showed they all viewed it as academic.

In an attempt to build a pool of tutors and workshop organizers suitably trained to implement the African Primary Science Programme, Education Development Centre of Newton, Massachusetts in collaboration with SEPA had organized a six-month residential training course in Ghana. This pilot effort indicated that future plans for tutor training activities should be institutionalized in a university environment. The reasons were[9]

> First, in order to attract the most qualified candidates some kind of credentialling of course graduates would be important. Probably only a university could provide such certification acceptable to governments for upgrading and salary increase purposes. And secondly, an institutional setting was vital for such a long-term course in order to supply the necessary logistical support for needs (such) as housing, food, library and recreation facilities, etc.

Two nine-month training courses were later conducted at Njala University College in Sierra Leone during 1975 and 1976. An external evaluation of the first course was conducted in September 1975 and "concluded that the program had met a compelling need, was ably run by Dr. A. I. Kamara, the course Director (though badly understaffed) and stated that the participants uniformly praised the quality of the training they had received."[10]

Objectives

The objectives of the science educators training course were

1. to give participants opportunities to have direct experience, under professional supervision, of the roles of tutor, curriculum developer, and organizer of workshops for in-service teachers;

2. t o educate participants to acquire: (a) ability to construct units of instruction and teachers guides; (b) an in-depth capability in the area of questioning; (c) ability to analyse units of instruction; (d) ability to resolve conflicts between the syllabus on the one hand and broader education objectives on the other; (e) ability to work fruitfully with teacher candidates and with primary school children; (f) sensitivity to the cultural context of the learning situation; (g) ability to improvise science learning materials; (h) facility in conscious application of learning principles; (i) willingness to accommodate educational change; (j) ability to make quick and professionally accurate evaluative decisions about learning situations; (k) willingness to make critical appraisals of one's performance on the basis of one's reflections, readings, and conversations with others.

3. to train personnel from SEPA countries to implement the African science programme;

4. t o disseminate the SEPA philosophy and approach through participants in the training course;

5. develop institutional support for the course in the University of Sierra Leone.

Plan of Work

The plan of work required SEPA to conduct annual nine-month residential training courses for science educators from African countries. The courses would be conducted in collaboration with the University of Sierra Leone. The decision to run the courses at Njala University College was based on that College's long association with SEPA and on the presence there of highly qualified science education staff with considerable experience in curriculum development and in the training of teachers and teacher educators. Also, Njala provided a suitable rural setting with appropriate, though minimal, educational facilities. These factors as well as others such as a receptive college administration and excellent rapport between the College on the one hand and focal schools and teacher training colleges on the other, were essential ingredients for success.

The project would also develop its own curriculum. It would aim at generating in the trainees attitudes of self-discovery and inner strength as well as analytical skills. To meet this aim the curriculum would incorporate the following seven aspects of pro-

fessional education: (i) direct experience in primary school classrooms; (ii) direct experience in teacher training colleges; (iii) mastery of in-service teacher education techniques that promote teacher development; (iv) curriculum development; (v) improvisation of hardware materials that promote learning; (vi) educational evaluation; (vii) design and carrying out of research studies in education. These aspects constituted a minimum of desirable offerings.

Periodic "external" reviews would be a regular feature of the project. The reviews would not be funded from the AID grant. Also, each review would be conducted by a person who was neither a regular staff of SEPA nor a member of its governing bodies; but it had to be someone very familiar with the SEPA philosophy and very conversant with inquiry-based approaches to learning. The purpose of the reviews was to (1) study, review and evaluate the project paying particular attention to its curriculum materials, instructional aids as well as methods and techniques developed; (2) make recommendations as to the ways and methods of continuing the experience and expanding the results on a long term basis. In other words, the reviews would serve as feedback to the SEPA Secretariat and to the staff of the training course. In addition, they would serve as a guide for future plans.

Target Groups

The training course was designed to enhance the further professional development of teacher educators (or training college tutors), curriculum developers, in-service teacher education organizers and supervisors, and of primary science education specialists. As in the case of the project for the development of teacher training materials, the focal groups in this training course are the litmus paper in the acid test of educational change. They are the groups who can be very effective in large-scale implementation of new educational practices, but who in Africa were ill-equipped to do so expeditiously.

By virtue of its functions and activities each of these groups can reach large numbers of learners and professionals in a country's education system. Teacher educators or tutors do so through the training college students they train; curriculum developers reach large numbers through written materials they produce for the national education system; organizers and supervisors of continuing education for serving teachers can exert a strong influence on many teachers with whom they interact professionally and continually. Specialist teachers on elementary-school science on their part can create in their schools a science education atmosphere permeated by their preferred approach to learning or teaching; if they prefer a problem-solving approach, they can make problem-solving pervasive in their schools. The selection of the target groups, therefore, was dictated by their centrality in the enterprise of education development.

Project Achievements

Following the completion of the second course in September 1975, an evaluation of the project was conducted. The evaluation group, led by Dr. C. Agbenyega of Ghana, concluded that the program met a compelling need, was ably run by Dr. A. I. Kamara, the course Director, (though badly understaffed) and the participants uniformly praised

the quality of the training they had received. Excellence has characterized all the subsequent courses. Achievements of the project have been in a number of spheres but the four most important are the development of human resources, improvement of educational practice in teacher education, research studies, and institutionalization.

Human Resource Development

That the course fulfils a compelling need in human resource development can be deduced from the fact that the numbers of participants have risen to the point of straining the facilities available at Njala University College. Enrolments for FY76-FY82 are shown in Figure 2.

Figure 2

SCIENCE EDUCATORS TRAINING COURSE GRADUATES

FY 76

Name	Country	Name	Country
Fornah, D.	Sierra Leone	Manda, P	Zambia
Jack, S.	The Gambia	Muga, J.	Kenya
Kai Kai, A.	Sierra Leone	Nyarko, S.	Ghana
Lepelesana, D.	Lesotho	* Peabody, A.	Liberia

FY 77

Name	Country	Name	Country
Badu, S.	Ghana	* Mokati E.	Lesotho
Chirambo, S.	Malawi	* Moliko L.	Lesotho
Chungu, A.	Zambia	Njoroge, N.	Kenya
Etoku-Edogu, E.	Uganda	Nkhoma, M.	Zambia
Jones, S.	The Gambia	Ogwang, P.	Uganda
Mallah, J.	Sierra Leone		

FY 78

Ansong-Ntiri, J.	Ghana	Mustapha, A.	Sierra Leone
Gassama, M.	The Gambia	Onuorah, I.	Nigeria
Kandeh, S.	Sierra Leone	Sonile, H.	Liberia
* Leburu, F.	Botswana	* Thabede, A.	Swaziland
* Maphasa, N.	Lesotho		

*Female student

FY 79

Name	Country	Name	Country
Abeti, S.	Uganda	Matandiko, J.	Zambia
Adebua, S.	Nigeria	Molapo, A.	Lesotho
*Bobb, J.	The Gambia	Phadi, H.	Botswana
Lwenga, W	Zambia	Saine, H.	The Gambia

FY 80

*Acquah, E.	Ghana	Ngemezulu, E.	Zambia
Ben-Enjiku, D.	Uganda	Ojemuyiwa, A.	Nigeria
*Ebhojie, G.	Nigeria	Opong, I.	Ghana
Fisher, P.	Sierra Leone	Sanyang, K.	The Gambia
Kamara, B.	Kenya	Simiyu, P.	Kenya
Licon, A.	Sierra Leone	Waiswa, S.	Uganda
*Manyeli, C.	Lesotho	Wina, N.	Zambia
Matsie, A.	Lesotho	Yabo, O.	The Gambia

FY 81

Annan, V.	Ghana	Kulor, E.	Ghana
Bisika, J.	Malawi	Mami, J.	Sierra Leone
Cham, F.	The Gambia	Musukwa, E.	Zambia
Chingolozi, E.	Malawi	Njie, M.	The Gambia
Conteh, K.	Sierra Leone	Ojwang, A.	Kenya
Dadi, B.	Ethiopia	Sakala, P.	Zambia
Kamara, T.	Sierra Leone	Wesley, E.	Liberia

FY 82

Dlamini, B.	Swaziland	Ngambi, M.	Zambia
Dlamini, F.	Swaziland	Quaye, E.	Ghana
Ibrahim, M.	Somalia	Sitima, C.	Zambia
Jammeh, J.	The Gambia	*Tarplah-Molley,	Liberia
Johnson, C.	Sierra Leone	*Tawia, M.	Ghana
Mpama, R.	Tanzania	Zulla, Y.	Ethiopia
Nsong, R.	Cameroon		

The demand for the training provided in the course has been overwhelming. But due to limitations of financial resources and of the physical facilities at Njala, numbers have been kept relatively small.

An examination of Figure 3, showing the distribution of trainees by country, reveals a great need still to train many more people from each African country.

Figure 3

GRADUATES OF SETC PER COUNTRY PER YEAR

COUNTRY	FINANCIAL YEAR								
	75	76	77	78	79	80	81	82	TOTAL
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	2		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

Practically all the course graduates play key roles in education development in their countries. A very large majority work in curriculum development institutions or as tutors in primary teacher training colleges. Others went for further studies and have assumed higher positions e.g. principal of teacher training college, chief inspector of science, etc. Regardless of positions they hold, the graduates are highly motivated and participate in the conduct of workshops for in-service teachers in their countries. They have been a major factor in the successful dissemination of the products of the teacher training materials development project.

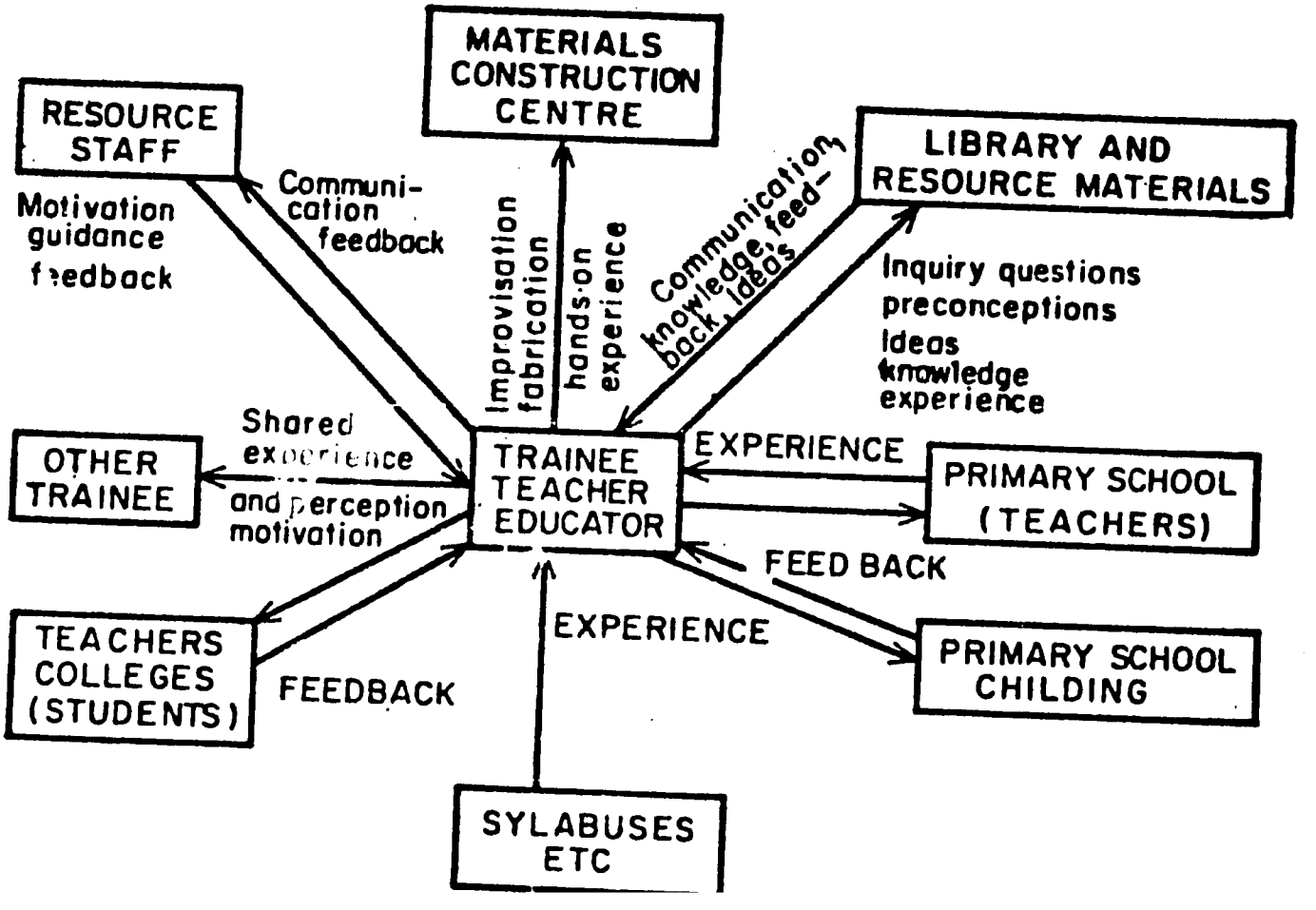
Educational Practice

More than numbers, a major contribution of the project has been the design and successful implementation of a teacher educator training model for the practice and dissemination of a problem-solving approach to learning. No other institution in Africa has attempted that task in as systematic a fashion as SEPA and the University of Sierra Leone have done. As shown in Figure 4, the trainee is the focal point and all training experiences are organized around the knowledge and skills he/she requires to play his/her professional role effectively after completion of the course.

In this operational model the trainee is motivated by problem situations or experiences organized by resource staff. By the manner of their response, the resource staff impress upon the trainees that the course is based on the learners' willingness to take charge of their own learning using all the available resources shown in Figure 4 and others the trainees themselves must identify, with the help of the resource staff if necessary. From there on, the trainees understand they are partners with the resource staff in a shared goal but with differing, albeit equally important, responsibilities. The major components of the goal, as stated earlier in this chapter, include the development in the trainees of (a) questioning skills; (b) skills in translating syllabus topics into instructional activities; (c) skills in improving teaching/learning materials; (d) working fruitfully with children, teacher training college students, and with in-service teachers; and (e) sensitivity to the learner's cultural contexts. Facility in these components is one of the main ingredients of excellence in science teacher education but which had hitherto not been highlighted in African programmes.

Figure 4

SETC TRAINING MODEL



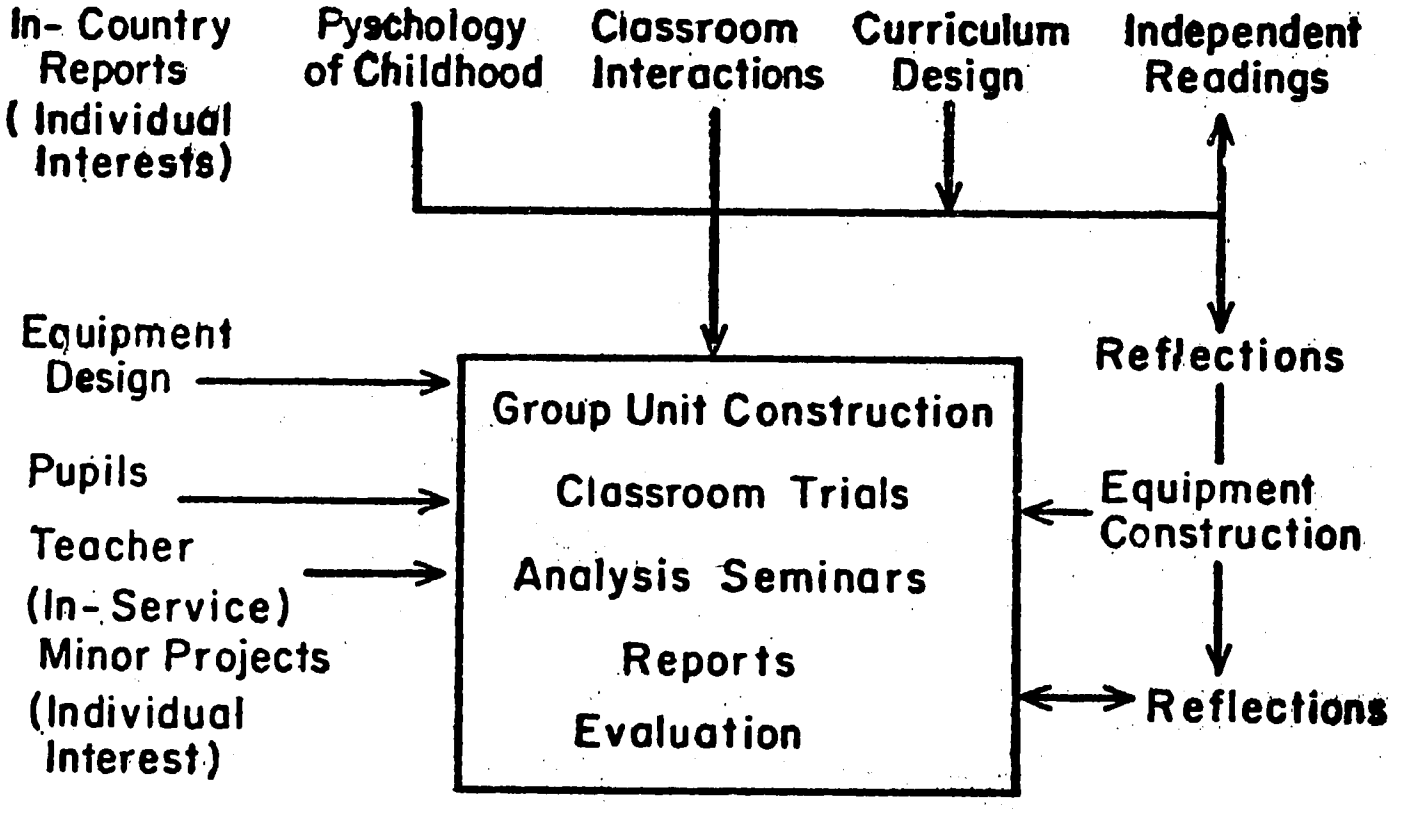
The main responsibility of the trainees is to take charge of their own learning instead of laying back content with listening to lectures and taking down notes. Being responsible for their own learning means active participation in determining the educational activities of the course and in self-and peer-evaluation. Three of the more important responsibilities of the resource staff are guidance, quick feedback, and adequate provisioning. A proper discharge of these responsibilities enables the trainees gain maximum benefit from their efforts.

An appropriate process for implementing the model was devised. Course offerings are integrated on the basis of the expected roles the trainees will play after completion of training. Traditional programmes centre on individual courses such as educational psychology, educational theory, philosophy of education, methods, and so forth; the courses are taught by different lecturers or professors who neither interact with one another nor interpret the theoretical foundations of the courses on the basis of situations the trainee teacher educators and curriculum developers will meet in practice. The SETC on the other hand utilizes lecturers and professors as a team of resource staff; the activities of the trainees are problem-focused with course offerings furnishing additional illumination. Figure 5 is a diagrammatic representation of the integrated nature of the offerings during the first term.

The first term focuses on a key problem issue carried out in such a way that other learnings arise in relation to it. The construction of a teaching unit has always been the focal activity in term 1. Individual activities were preparation of a report on education in one's country as well as pursuance of a small project according to individual interest.

Figure 5

TERM 1 OFFERINGS



The second term builds on the meaningful learnings of the first term. The major focal activities are teacher training college teaching and continuation of the group unit while an individual activity is development of a philosophy of science through construction of a personal unit. Figure 6 shows these relationships. During the third term the major focus is curriculum development. Selection and development of a major project form a major individual activity which culminates in a thesis. Work on the personal unit is also concluded during the third and final term as shown in Figure 7.

Figure 6

TERM 2 OFFERINGS

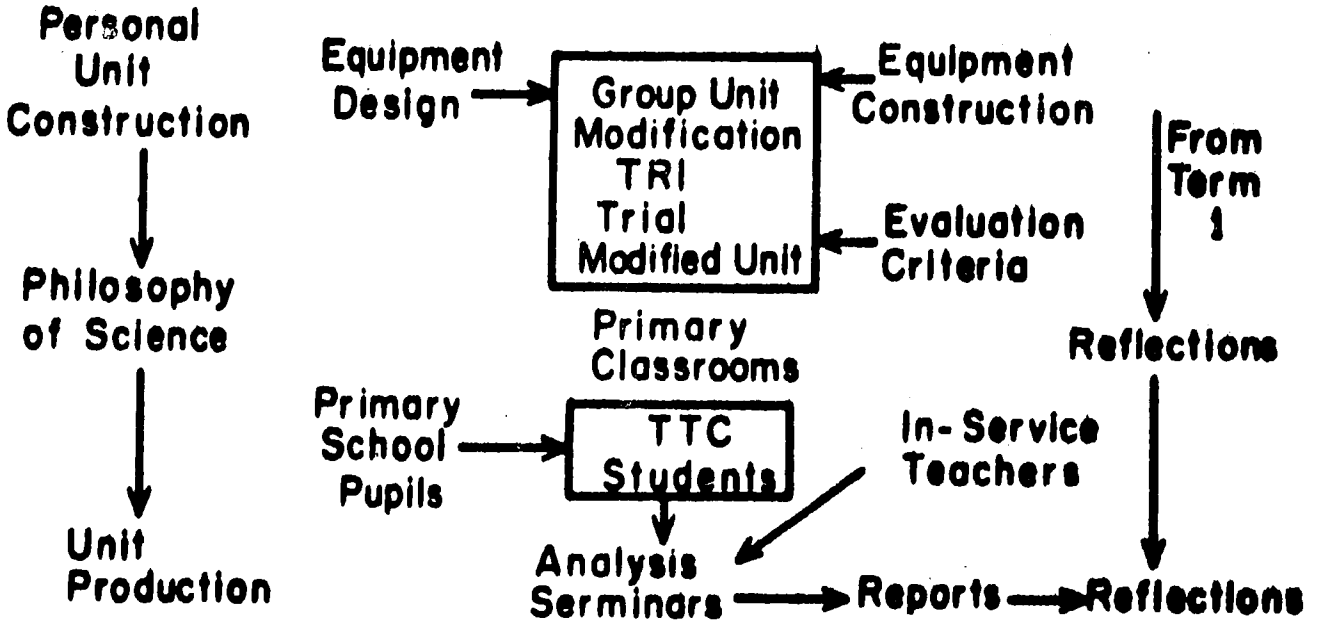
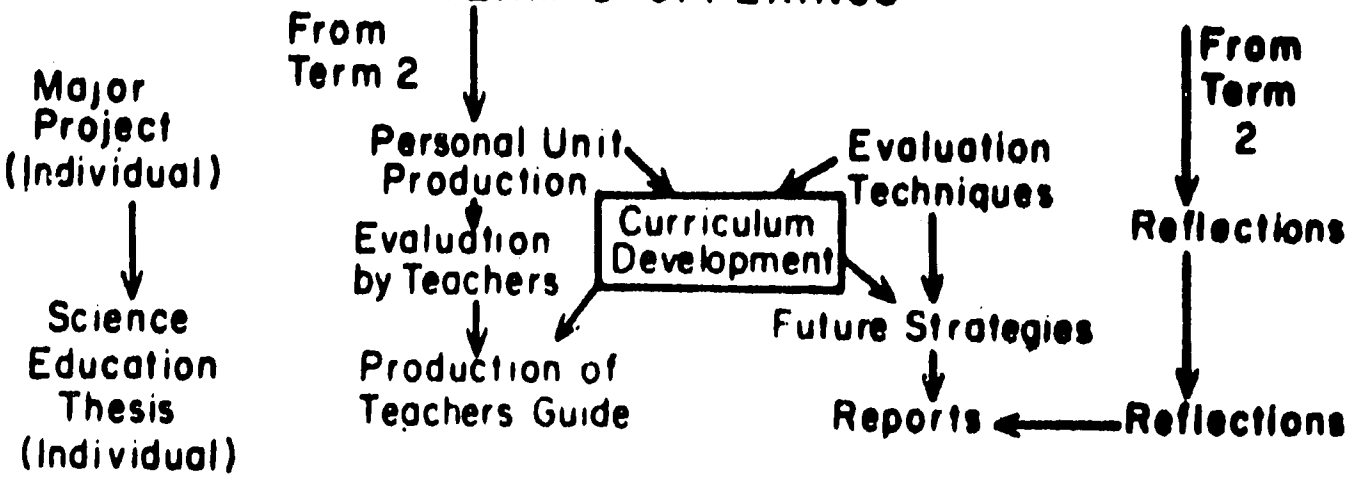


Figure 7

TERM 3 OFFERINGS



Seminars, instead of lectures, are the major vehicle of interactive communication. There are two types of seminars: those arising out of readings or activities undertaken by the trainees or resource staff and those generated by trainees' reports on their "reflections". The first kind is for exchange of ideas on experiences or thoughts arising out of readings; the discussions generate or highlight problems that become the focus of attention and engage all the trainees in a search for solutions. The kind of seminar arising out of "reflections" helps to bring into play the important habit of abstracting educational meaning from one's experiences. The seminars form the hub around which readings, practical work, and research studies revolve.

The portrayal of reflective abstraction as a powerful educative tool in training programmes is one of the project's outstanding contributions to educational practice. Referred to generally as reflections, the concept comprises a short narrative of an experience to bring into focus the context from which the experience emanated, and an abstraction (from the narrative) of a restructured notion that makes the experience meaningful in a person's frame of reference. One of the trainee teacher educators described reflection in these words:[11]

> These (reflections) were taken to mean an individual's thoughts after a few experiences encountered. They included how one interpreted the experience so as to accommodate it among his other former experiences and how with the addition of this new experience one is ready to acquire new other encounters ...
>
> Whenever a new experience was encountered one had a big problem of giving this a personal meaning within the existing pattern. This meant making one's mind open and receptive. In this state of mind some old ideas had to be given up and others had to be changed or modified a little in order to work in harmony with the new experiences. Dismissing some old strongly held views and/or changing others was generally the most agonising stage, because at one point in the process one remained without any properly established philosophy. It looked as if one was sitting on the fence which divides a pool of new ideas on one hand and that of old ideas on the other ...
>
> At times one communicated the new ideas with friends informally. When this happened some modifications were made through such discussions. At other times one read books or papers about these (new) ideas in order to consolidate them.

Dr. A.I. Kamara, the course director, has written that reflections can (a) help trainees and resource staff assess more accurately changes taking place in each individual's thinking as he/she progresses in the course; (b) make participants become more analytic and sensitive to one another's problems; (c) provide a continuing forum for a re-consideration of previously discussed issues but which have not been integrated completely into trainees' intellectural framework; (d) facilitate feedback among trainees and assist them in formulating, and articulating their thinking. The trainees use "reflections" as a strategy in their interactions with in-service teachers, elementary school

children, and with primary teacher training college students. As they continue to employ this strategy in their work after graduation, the trainees will disseminate it through their own students or in curriculum materials they produce.

Research Studies

The project has generated considerable action research by the trainees and staff. Practical research by the trainees consisted of the design and construction of hands-on instructional material, development of units of instruction, experimental projects in the conduct of in-service workshops, mini-projects, and thesis research. Completed theses are listed in Appendix L

Faculty research studies arising out of the course include the following:

C. O. Agbenyega:	Training Science Educators for Africa: SEPA, Accra, 1975
M. J. A. Cole:	Science Educators Training Course (SETC) Handbook. Njala University College, September 1981
D. S. M. Kamanda:	"Inquiry and the Education of Science Teachers: Off the Traditional Programme". Njala University College, March 1976.
D. S. M. Kamanda:	"On the Supervision and Evaluation of Student Teaching". Njala University College, November 1976.
A. L Kamara:	"Primary Science Tutor Preparatory Programme" Njala University College, n. d.
A. I. Kamara:	"The Teacher's Role: What Help Do Teachers Need?" ED-80/CONF 618/12, UNESCO, Paris, May 1980.
J. O. Obemeata:	Science Educators Training Course. SEPA Accra, 1979.
O. R. Ohucho:	The Science Educators Training Programme. SEPA, Accra, 1977.

Institutionalization

The course has been institutionalized at the University of Sierra Leone (Njala College). A University Senate resolution incorporated it into the regular academic offerings of the University. Trainees' applications are processed by the Faculty of Education at Njala University College. The College charges the trainees normal fees and tuition costs and provides accommodation, academic facilities, health, and library services. Course participants are subject to the same rules and regulations governing academic progress and general behaviour of other university students. Upon successful completion of the course, each trainee is awarded a certificate or diploma under the seal of the University of Sierra Leone.

The University of Sierra Leone pays all the staff of the Science Curriculum Development Centre who offer courses, instruction, and academic advisement to the trainees. The staff perform these tasks over and above their regular university academic and administrative assignments without additional remuneration. In 1981 the staff of the Centre consits of:

Mr. J.A. Cole, Ph.D.	:	Director of the Centre
A.I. Kamara, Ph.D.	:	Project Director
D.S.M. Kamanda, Ph.D.		
Juliana M. Amara (Mrs.) M.S., M.Ed.		
S.A. Bockarie, M.A.		
S. Jarrett	:	Technician

The facilities at Njala are modest and have been stretched to their limits. For this reason, the course intake is not likely to increase; even the maintenance of current levels poses serious logistic problems for the College.

The project has been evaluated twice since 1976. The 1978 and 1979 reports of these external evaluations have been circulated widely. Both were unequivocal about the superior quality of the course and about the excellent manner in which it is run. Both concluded that the project is fulfilling a compelling need in education in Africa and that its unique approach can yield considerable mileage in education development.

Reflection

Reactions to the training course have been very positive - from the trainees themselves, the countries which have benefitted, the staff at Njala University College, and from external evaluations. SEPA is satisfied the project is ably run; it has established SEPA as an institution with creative responses to African countries' needs. For the project to realise its full potential, however, the facilities at Njala must be improved. Njala should be helped in its search for capital development assistance to be channeled through the government of Sierra Leone. Accommodation and library facilities need expansion, and

vital instructional aids for teacher education (e.g. audio and video equipment) must be obtained.

An important missing component in the SETC project is faculty and staff exchange with other SEPA-supported training projects e.g. the Educational Evaluation project at the University of Ibadan. An exchange with Ibadan would enrich the evaluation offerings of SETC and broaden the perspectives available to the trainees. A visiting professorship would also be a valuable addition to the project: trainees would have an opportunity to interact intensively with an outstanding scholar and practitioner in a specialized aspect of teacher education.

An oversight in the plan of work resulted in the omission of follow-up workshops. Graduates of any teacher education project, but especially of the SETC, need occasional professional stimulation from their instructors and from one another for a number of years following graduation. Such professional stimulation is useful not only for counteracting post-training problems but also as a mechanism for exchanging experiences with others sharing a common professional orientation. It also helps to provide constructive feedback to the staff and to their sponsors. It was possible to organise only one follow-up workshop. The excellent attendance and animated and enthusiastic exchanges of experiences and perceptions were expressions of pure joy over a sorely needed re-union.

Logistic problems caused by inflation and poor communication in Africa suggest that some budget items such as travel and supplies should incorporate flexibility. Budget allocations for each trainee still reflect 1975 expenditure levels (when the grant request was submitted to AID). There should have been provision for adjustment of expenditure levels on these items during the six years the project has been in operation.

Desirable Future Activities

The outstanding achievements of the project are to a very great extent due to SEPA's decisive participation in it. SEPA was responsible for its design, pilot testing, and its successful implementation. SEPA provided the initial fellowships and continues to award a minimum number utilizing AID grant funds. It was also through SEPA's initiative and assistance that African countries received fellowship support from the Commonwealth Fund for Technical Cooperation and from the German Foundation for International Development. Until fiscal year 80, SEPA also furnished a director for the project. After all this investment of effort and funds, SEPA ought to maintain a presence in the project, perhaps by continuing to award a few fellowships. SEPA's awards would increase its credibility to its newer members and reassure older members of the organization's continuing vitality. The fellowships could be for a twelve-month Master's programme.

There is a growing need for the graduate portion of the course to offer a Master's programme. Already there have been numerous requests from African countries for a Master's offering. The upgrading of the graduate diploma programme would solve the problem faced by applicants who already have an education degree or a postgraduate diploma in education. For such persons another diploma is unattractive professionally.

Many of these applicants end up receiving scholarships to do a Master's degree overseas and return to occupy higher positions than graduates of the SEPA course. If the graduates of the SEPA co. :se are to continue playing critically important roles in the dissemination of the SEPA approach, then the SETC project should add higher level training to its current offerings.

The project has worked very well in science teacher education, it should work just as well in teacher education for environmental studies, agriculture, mathematics, and health. Njala University College produces teachers for these other subjects and the academic staff at Njala has expressed wishes repeatedly for the project to go beyond science education. Since the staff is available at Njala or elsewhere, a more broadbased course can be planned and run on a pilot basis. Teacher training college adminstrators would welcome such a course because it would provide balanced professional development among academic departments. And it would make dissemination through workshops for in-service teachers more practicable as the organisers of different subjects would use one approach.

There is a need to organize follow-up workshops to help graduates galvanize the SEPA approach in their day-to-day professional activities. Follow-up workshops will also help in keeping SEPA uppermost in the minds of administrators who will supervise rejuvenated graduates.

In 1980, participants at a Conference to Review Science Education in Africa recommended that an SETC be established to serve Francophone African countries. The staff of the SETC at Njala University College made the same recommendation. The educational situation in Francophone countries, however, is somewhat different from that in English-speaking Africa and an SETC project for Francophone countries need not be a replica of the course at Njala. Since SEPA membership includes Francophone countries, it is imperative for SEPA to be responsive to their needs and establish the desired training course.

Concluding Remark

The project for the training of science teacher educators in Africa exemplifies excellence and relevance in SEPA programming. It was an early "experiment" in the implementation of the "third country principle" in international aid. The third country principle in Africa was the training of nationals from an African country in another African country rather than in the donor country. The "experiment" has been a resounding success.

The SETC has shown SEPA's maturity in the management, administration, and implementation of an immensely complex project. The complexity lay in the coordination of action among different countries, many individuals, different funding agencies,

and an institution in a distant rural location, to achieve a single goal. The feat has been performed repeatedly ir the last seven years, and through the resultant graduates of SETC, the beneficent effects of the grant from AID will be multiplied in the years ahead.

CHAPTER 5

OUT-OF-SCHOOL SCIENCE EDUCATION*

The Need for Out-of-School Education

In a project proposal to AID in April 1975, SEPA observed that schools alone are helpless in effecting any dramatic change in rural life. Yet many environment-based science education programmes in Africa limit themselves to the education of children in schools. Given the high rate of wastage in the formal school system and the high percentage of children who were out of school, this limitation meant that a large proportion of young people in Africa were neglected educationally. That situation was untenable.

At the same time, however, many African countries had recognized the need to educate young people who were not regular schoolgoers and had initiated education programmes for them. But most of the programmes provided for youth centres, voluntary service, science fairs, physical education, sport and travel. A close examination of these programmes revealed that to a large extent they were formal education taking place away from the usual schoolroom under instructors imbued with urban values. Consequently, the teaching method used was mainly the classroom lecture approach dwelling on basic general information. Activity and problem-solving approaches were not used.

It was SEPA's conviction that for youth to participate effectively and prudently in rural development projects, they had to be familiar with problems of living in rural environments. They also had to be equipped with relevant cognitive and affective attributes for identifying and solving environmental problems related to health, agriculture, and resource conservation. Since very few existing programmes focused on improving the youths' understanding of their environment and on providing them with tools to solve environmental problems, SEPA decided to explore the idea of extending its science education approach to out-of-school youth programmes in rural areas.

There were additional considerations in favour of SEPA's decision to embark on an environmental science education for out-of-school youth in Africa: the formal school system was marked by considerable wastage. Large numbers of school-age children dropped out of school too early to profit from whatever basic education they had received or to retain basic literacy. It would be almost callous to ignore their existence and their educational needs.

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*Since October 1978 the activities of this project have been coordinated without salary by Dr. Marian E. Addy, Lecturer in Biochemistry at the University of Ghana. Dr. Addy has worked very closely with SEPA since 1976. During 1978-79 she served as Programmes Director at the Secretariat and also as Acting Executive Director.

Young people who completed elementary-school education but could not continue to the next cycle still required educational services to prepare them for the world of work. In the absence of those services, these youth drifted into the cities to become hangers-on and odd-job people living on the rim of starvation. They ultimately became alienated adults - dissatisfied with the work they do, and between and betwixt in their home environment because of early weaning from it and incomplete absorption into the "school culture." They became overwhelmed by feelings of hopelessness in dealing with their environment. SEPA saw it as imperative to carry out, on a pilot basis, a relevant environmental education for such youth.

It had also been observed that basic development activities in Africa, especially those concerning a primary industry such as agriculture, were carried out by rural youth. Agricultural practices were themselves changing, involving as they did more science-based methods of seed selection, fertilizer uses, land husbandry, cultivation, harvesting, and of storage. Scientific approaches had become evident also in hard technology activities, in health care, and in conservation concepts. Rural youth, therefore, needed to learn elementary systematic ways of carrying out these activities and of acquiring resource conservation concepts and practices.

An educational dividend that could accrue readily from a well-conceived out-of-school education project was the development among educators generally of an awareness of the utility of everyday livelihood activities as sources of learning. It was common in Africa to regard the situations described in textbooks written overseas as the only legitimate spheres of study. That was particularly true in the technical fields of study. SEPA could help put that intellectual myth to rest by demonstrating the efficacy of ordinary livelihood activities in the rural areas as vehicles for the delivery of powerful concepts in environmental science education.

It was thus an ensemble of observations that prompted SEPA to propose undertaking an education project for out-of-school youth. The observations demanded a project that would be at once excellent and responsive to the needs of youth with little or no formal education. Because it was a completely new venture, the project was framed in broad and flexible terms.

Project Objectives

In its request for financial support for this project, SEPA stated that the overall goal was "to create and utilize learning situations which will enable young people to be intimately familiar with the problems of living in their environments and to be equipped with relevant cognitive and affective attributes for the identification and solving of environmental problems." The proposal went on to say "appropriate contexts in the communities will be identified, suitable learning materials developed, and a number of people exposed to practical training to enable them play leadership roles." In a positive response to

SEPA, AID endorsed these objectives and identified the focal environmental problems as related to health, agriculture and resource conservation.

Stated briefly, therefore, the objectives of the project were: (a) development of an awareness of some local environmental problems; (b) sharpening of attributes essential for identification and solving local environmental problems associated with agriculture, health, and conservation; (c) identification of appropriate learning contexts in selected communities; (d) development of learning or training materials; (e) training of selected categories of persons to play leadership roles in out-of-school educative programs.

Plan of Work

The components of the plan of work were (a) holding of a planning meeting; (b) conduct of workshops for various purposes to achieve the objectives of the project.

The first activity of the project would be a planning meeting involving about 15 science education specialists to examine the status of existing programmes designed to reach out-of-school youths in member countries. The participants at the meeting would develop preliminary plans for a SEPA programme to improve the environmental awareness of these youths. It was also envisaged that the meeting would outline a programme of action for exploratory activities in several localities and prepare a comprehensive list of issues which required further planning action. Finally, the meeting would identify suitable participants for future project activities and prepare or select working documents for use in subsequent workshops.

The second set of activities was a series of workshops designed to (i) embellish project details outlined in the planning meeting; (ii) design prototype materials for eventual use in out-of-school science education activities; (iii) establish ways of collaborating with new and existing African institutions focusing on the education of rual youth in order to implement certain aspects of the project; (iv) document some on-going rural youth development activities upon which SEPA's project plans can be grafted; (v) develop and produce manuals aimed at assisting leadership groups whose activities impinge directly on the education of rural youths.

The grant Agreement summarized the plan of work in a manner that conveyed the development in the participating youth of an understanding of the scientific phenomena of their environment. It was, however, understood that SEPA's approach of inquiry and problem-solving would under-gird all scientific studies of the youth's environment. The emphasis on inquiry and problem-solving was of utmost importance because the application of the scientific method has provided the basis for progress in the development of agricultural and industrial techniques which have led to significant improvements in the quality of life. The same method could also provide solutions to many practical problems confronting rural dwellers.

Target Groups

Since this was a new venture for SEPA and there was hardly any suitable precedent to follow, it was difficult to specify most target groups before the planning meeting. One obvious target group, however, was the practitioner in the implementation of youth development programmes in SEPA's member countries. There was a variety of such programmes ranging from trade and crafts to middle level management.

Agricultural extension officers are also an important group as purveyors of useful agricultural knowledge; they serve as a link between farmers and sources of information and of assistance. Also they can motivate farmers to adopt improved and environmentally sound agricultural practices. Their roles cannot be overestimated where farming activities constitute the hub of rural livelihood occupations. Many agricultural extension officers, however, experience communication problems due to deficiencies in their training and to the nature of their programmes. In general, their training imbues them with urban values and preferences, emphasizes academic agricultural science, and does not develop appropriate skills for the communication of agricultural knowledge in the context of their clients' needs. Also, the objectives of their programmes lay stress on routines e.g. giving technical information such as where to obtain fertilizer, matchets, etc. or how to do contour ploughing, or space seeds or seedlings when growing different crops. Educational components on practical relationships between current practice by farmers on the one hand and the new information on the other are often omitted. The results of the change agents' efforts, predictably, have been unimpressive. SEPA's project aimed at improving the effectiveness of these change agents.

Adult educators and community developers are important target groups because the ultimate beneficiaries of their programmes include out-of-school youth. At present these groups adopt academic orientations in their work, concentrating mostly on upgrading academic knowledge to enable out-of-school youth complete higher academic qualification. SEPA can contribute its inquiry approach to these programmes and graft its approach on these aspects of adult education and community development focusing on non-formal education. By blending SEPA's work with the various adult education institutions, using one to augment the effectiveness of the other, a synergistic relationship between SEPA and adult education leadership can be built.

Project Achievements

1. Planning

To meet the objectives of the project SEPA identified sixteen African specialists in science education, educational foundations, volunteer group organization and in rural sociology. They were invited to a Workshop to plan the implementation of the project. They (a) developed guiding principles for the project; (b) identified a number of suitable case studies; (c) outlined components of a suitable model for conceptualizing SEPA's principles in programmes for out-of-school youth.

Guiding Principles

In this SEPA project, as in others, the focus is the development of human resources to acquire a repertoire of problem-solving skills and feelings of self-confidence in one's capability to influence one's environment in constructive ways. The project would also not develop in isolation from on-going training programmes for out-of-school youth; instead it would build upon them, adding problem-solving dimensions. For this reason, the project would identify and describe suitable on-going youth training programmes in SEPA member countries.

Another important principle is that the project should utilize socialization contexts common in many rural communities as starting points. Adherence to this principle would facilitate the harmonization of education with living in rural areas. In addition, it would encourage mobilization of talented, though illiterate instructors to assist in the achievement of project objectives. Most importantly, it would make it easier for trained youth to integrate themselves easily in the livelihood activities of rural communities.

Finally, the project must be seen to understand and appreciate the logic of the activities of rual communities and the wider consequences of changing people's established ways of interacting with the environment. Rural dwellers in Africa might resist change on the grounds that the change agents do not fully appreciate the complexities of implementing the change. SEPA would bear in mind that different societies and communities value skills and specializations which are functional in specific contexts; SEPA's project should build upon those valued skills.

Some Suitable Case Studies

The specialists participating at the planning workshop identified and described briefly a number of programmes upon which SEPA could build its activities. Six of the programmes were:-

The Fishingand Boat-Building Project. This apprenticeship project is at Tombo in Sierra Leone. The community's main occupations are boat-building and repair, fishing, and fish marketing. Out-of-school young people undergo a graded training programme of apprenticeship in each of these occupations. SEPA's participation in the project would result in the introduction of improved training procedures, better designs of boats and fishing gear, and in the availability of requisite hardware.

The Integrated Rural Workshop. Located at Winneba in Ghana, the project specializes in the education of blacksmiths most of whom are non-literate. Blacksmiths who worked individually in isolated villages were brought together for training in metalwork-production of hoes, files, wheelbarrows, safety locks, coal pots, planes and a variety of other items as well as in repairs and improvisation of farm equipment. The learners are blacksmiths who are learning fine details of the trade and a few scientific methods. They also learn to improvise and make tools from discarded scrap metal (e.g. from broken saws). The IRW is under the direction of the National Vocational Training Institite.

Women's Organizations in Lesotho encourage the development of traditional industries such as spinning, knitting and weaving. They train themselves, and sometimes schoolgirls, in these skills. But the problem has always been a lack of technical inputs to help them adapt their methods and sills to modern demands. SEPA could collaborate with these groups to solve technical problems.

The Betty Carew Women's Training Centre (Sierra Leone) was established to bring women together for mutual learning experiences; to revive and improve women's traditional skills including child care and nutrition; to enhance women's self-reliance and self-image; and to stem the tide of depression sweeping the rural communities in the Yoni chiefdom. The skills learned include making hand-bags, purses, bracelets, belts, necklaces, earrings, and table mats using the delicate art of Macrame. Dresses for children and for adults are also made.

In Kenya a number of efforts had been made to tackle the problem of youth unemployment throughout the country mainly by using the Village Polytechnics. But the village polytechnics appeared to have a number of limitations which made them less effective than had been anticipated. An opportunity was taken therefore to see how the SEPA model could be applied to an existing village polytechnic in order to increase its effectiveness.

In the Awka Community (in Nigeria) two major occupations are farming and blacksmithing. The practice had been to apprentice children to blacksmiths. But with the introduction of universal primary education a change in the apprenticeship system is essential otherwise the growing loss of interest in blacksmithing will reach crisis proportions. SEPA animateurs would revive interest in it by selecting elementary school children for training in blacksmithing after school as well as by attempting to incorporate the apprenticeship into the formal school sector.

Blacksmiths in the community could be organized into a co-operative and the children would spend about two hours a day understudying master craftsmen. Upon completion of primary school, some of the children could take up the trade full-time while others could continue part-time after school hours. As the project progresses, it will incorporate carving because Awka carvings are unique and yield quick dividends. The project will encourage use of local materials and will also investigate traditional systems of education in the Awka areas. Other case studies identified were the Mwanamulimu Clinical Centre in Uganda and the KintampoRural Health Project in Ghana.

Conceptual Model

The planning meeting evolved a model for conceptualizing SEPA's approach and mode of operation in out-of-school youth education programmes. Very careful examination of the case studies yielded the following points: (a) assessing community needs is an essential early step when undertaking a specific programme of activities. It would be from the context of identified needs that specific strategies for creating new levels of

equilibrium would arise; (b) needed changes and appropriate mechanisms for bringing them about must be identified on a collaborative basis with the community; (c) successful out-of-school youth education projects exhibit (i) accurate identification and public involvement of key people in the community; (ii) adoption of existing community decision making processes; (iii) mobilization of community resources; (iv) wise selection of change agents or animateurs; and (v) effective use of legitimate formal and informal communication channels.

Even from a consideration of a few case studies it was evident that many more points could be added. Enormous details could be generated according to the types of communities and projects under study. To maintain consistency of approach and practice a three-dimensional conceptualizing scheme was developed. Once a community project has been identified three major interacting items become the focus of attention, namely, the attributes of the community, operational elements, and interaction processes. A community project may be education of youth in metalwork, textile industry, agriculture, etc. Community attributes relating to any of these spheres of living are attendant attitudes, beliefs, customs, norms, learning styles, and so on. Included under elements are roles of key or "significant" local and national people, methods; operational tools; useful structures (physical and organizational); available skills; communication lines; economic situation; and so on. Six interaction processes deemed important are orientation (familiarization, understadning important elements for success of other processes, ways of achieving rapport), identification (identifying positive and negative elements, identifying oneself to target groups, identifying locus of decision), exploitation (utilization of favourable situation to achieve projected objectives, judicious use of key elements), feedback, evaluation (identity of programme with community, worth of project), and resolution (establishing beneficial terminal relationship between community and external change agents).

The three interdependent dimensions are in continuous interaction. For example, an accurate assessment of the community's elements is not sufficient; it must be reinforced by a sensitivity to the community's attributes and by propriety in the selection of interaction processes. A poor decision in any of the three dimensions can jeopardize an otherwise useful project.

The model is used as a planning tool to enable SEPA make appropriate responsive action when participating in a project. It can also be used as an analytical instrument in the evaluation of the effects of SEPA's participation in rural development projects.

2. Manuals

Seven manuals have been produced and are ready for trial usage. The first manual describes SEPA's approach to the education of out-of-school youth and describes in detail SEPA's model of participation in on-going projects. The second manual describes items and procedures of needs assessment. Drawing illustrative examples from successful

projects, the manual discusses the rules of the community, an external agent, and of the community, and external agent working together in assessing the community's needs. The manual also discusses in detail (with examples) how to assess project requirements such as human and other resources, suitable processes to adopt, and evaluation. In conclusion, the manual deals with the roles of internal change agents and learners.

Three additional manuals focus on SEPA's contribution in three on-going projects. Each of the manuals provides instruction on recruitment of learners and procurement of materials, orientations of the learners, motivation, instructional procedures (e.g. methodology, clarifying aims and objectives, assessing current skills of learners, etc.), training for production, development of management skills, and evaluation. All three manuals are addressed to trainers. The sixth and seventh manuals are a 72-page Handbook for agricultural change agents and an application of SEPA's model for analysis of out-of-school youth education projects. Trial usage of all manuals is pending.

3. Human Resource Development

SEPA organized and conducted training workshops for administrators and instructors of institutions engaged in the development of youth trainers. The planning and design workshops for administrators and instructors of institutions engaged in the development of youth trainers. The planning and design workshops were, in reality, human development activities because in these workshops all participants were exposed for the first time to the SEPA approach to science education. They also learnt for the first time how this approach would lead to effective environmental education. Case studies were used as subject matter for discussion among the participants. A training workshop for trainers of agricultural extension agents was held in The Gambia. Specific points of instruction were: setting up a facility, recruitment and mobilization of trainees, development of an instructional programme, and materials and post-training follow-up activities. The participants also received practical training in the development and writing of manuals for extension agents.

Thirteen trainers of adult and youth educators participated in a training workshop held in Tanzania. Manuals already developed under the project formed the basic training materials. Practical work covered the following aspects of the training of adult and youth educators; determining the rationale and objectives of training, planning the education programme, involvement of different support agencies, developing materials, and utilization of facilities and resources. Additional topics covered were community involvement, setting up an incentives system, evaluation, and follow-up.

All the training activities are still exploratory. They will lead to the production of more training manuals and other educational materials.

Reflection

Planning

Unlike all the other activities funded under the terms of this AID grant to SEPA, the project for the science education of out-of-school youth was a completely new activity. Like all SEPA programming activities, however, it aimed at creating a higher level of equilibrium in youths' activities by making productivity in problem-solving a major goal. Before embarking on this project, SEPA as an institution had not participated in non-formal education programmes, but its Executive Director at the time SEPA submitted the proposal to AID had been a leading consultant to UNESCO and UNICEF on education for rural development in Africa. He helped dispel many doubts about the feasibility of the project. All the same, the tasks of designing and implementing the project faced enormous problems.

The identification of specialists to design the project was difficult. Staff of youth development projects tended to view science only as an academic discipline and were, therefore, reluctant to associate themselves with a science project. Even when they did, their understanding of science made them expect SEPA to give expository instructions. Further, personnel in non-formal education programmes were uninformed about SEPA and its activities and consequently were unprepared for collaboration with SEPA. Eventually, the time-tested SEPA practice was adopted i.e. people who had a thorough knowledge of SEPA collected data on promising non-formal education programmes (including staff) in their countries. The data formed a basis for planning SEPA's participation in the education of out-of-school youth. The data collectors formed the core of the planning workshop.

A second important tactic was the decision to build upon on-going programmes of existing institutions serving out-of-school youth. This had been a feature of earlier SEPA/APSP activities which supported science curriculum development centres in Africa. In the case of non-formal education, the cornerstone for project development would be collaboration with functioning institutions.

The decision to include a strong development component was in keeping with established SEPA practice in the formal sector. Not only would development attract the best minds to the project, it would also introduce higher levels of aspiration and productivity among leadership personnel. Increased leadership productivity in turn would translate to more efficient youth training programmes.

The development of a conceptualizing model was an ingenious tactic for preventing SEPA from wallowing in vast masses of data. The APSP units, the projects for the development of teacher training materials and the training of science teacher educators had all been designed and developed within recognisable frameworks, and recognition of the power of those models led to development of a model for non-formal education.

Basic Education Development

SEPA's plans for the development of basic education for out-of-school youth anticipated African countries' desires to provide education for all young Africans. The report of a Conference of Ministers of Education in African countries held at the beginning of 1976 observed that many governments "feel that the youth or the adults who have not attended school, or have not benefitted from adequate schooling should receive, through different modes of delivery, basic education common to all and to which every individual is entitled. This should help all to develop their own potentialities as human beings and also help them play useful roles as producers and as citizens."[12] The Conference noted further that "basic education should make it possible for every individual, when circumstances permit, to build upon the basis of essential knowledge, attitudes, values, and skills."[13] In the project for out-of-school youth education, therefore, SEPA was responding to a widely felt need in Africa.

The development of non-formal basic education focusing on the cultivation of productivity skills, attitudes, and values was not as straightforward as originally conceived. A great deal of exploratory work was necessary resulting in an extended examination of alternative sets of action. Consequently, the project has only begun to organize workshops for adult educators, who also work with youth. For the same reason, the manuals have not been trial tested and no project evaluation has yet been undertaken. In other words, the grant period is coming to a close just when this project is on the threshold of implementing a skills and attitudes development phase. This apparent lag should not be alarming because unlike all the other projects which are in the third phase of AID funding, the out-of-school youth education project is in its initial phase of operation. Viewed from that perspective, it has progressed on schedule.

Productivity

Sometime ago, education development in Africa was viewed in isolation from other development issues. Not any more. Ample evidence shows that many African countries now relate education to their national policies and to the development of a productive person; a person who, in the words of the 1976 Conference of Ministers of Education, "will be deeply rooted in the cultural traditions of Africa, and in the African environment, aware of his political and civic responsibilities; of his duties to his family, and prepared to play a useful role as a producer and as a citizen in the economic and social development of the community."[14]

By utilizing ordinary livelihood activities as vehicles for youth development, SEPA encourages building and improving what is already familiar. It demonstrates that small but very significant changes can be made in those activities to minimize drudgery and enable each person produce more, so that all can lead better lives. This SEPA strategy teaches problem-solving by helping learners solve problems they see as real and immediate.

Image of Non-Formal Education

If one uses resource allocation to deduce the value placed on formal and on non-formal education in Africa the conclusion would be that more value has been placed on formal education. Indeed, the idea was widespread that non-formal education was an inferior substitute to formal education, suitable only for those who could not cope with the academic demands of the formal school.

In the last ten years, however, there has been a rethinking of educational structures in Africa. The education sector has become more embracing and flexible combining formal and non-formal education in imaginative ways. Thus school and out-of-school education have become mutually supportive in attempts to integrate the individual with the community and the environment, and equip him for productive work and for participation in the progress of the community. By incorporating a project for the education of out-of-school youth in its work, SEPA has utilized its high prestige and reputation to give the image of non-formal education a needed and deserved boost. It has also brought into sharper relief the important roles of institutions and associations involved in non-formal education programmes.

Desirable Future Activities

As already indicated, this project is still in its first phase. A great deal remains to be done in the education of leaders of youth development groups to help them play their roles more effectively.

All the manuals need to be trial tested. A manuals trial programme would increase the number of leaders and instructors who have been exposed to the SEPA approach to out-of-school youth education. It would also improve the manuals themselves. The "model" developed by SEPA needs more refinement through use so it can serve as a reliable instructional and evaluative tool. A review of the project activities to date and of the direction the project is taking is absolutely necessary. In short, the project for the science education of out-of-school youth has only made an excellent start.

CHAPTER 6

DISSEMINATION AND CONSULTANCY

I. DISSEMINATION

The goal of every education development agency is to implement the products of its activities in institutions for which they were designed. SEPA is no exception to that rule. The institutions for which SEPA products are destined encompass educational planning, curriculum development, pre-service and in-service teacher education, educational supervision, educational evaluation, and childhood education.

In centralized education systems - as in African countries - the process of ensuring that educational products reach, and are used by the target audiences involves creating a receptive atmosphere at various points in a nation's education system. It also requires presentations and demonstrations attesting their suitability and efficacy. A third component in the process is the training of personnel to use the products in the pursuance of desired educational objectives. Finally, availability of the products in sufficient quantities leads to their proliferation in their original or adapted form and to follow-through. Embedded in each component of the process are specific mechanisms of communicating about the products, determined largely by the nature of the products and also by the manner of operations characteristic of the agency. For example, hardware products might employ shop activities as a mechanism, and an authoritarian agency may use lectures as a dissemination mechanism.

In the case of SEPA a receptive atmosphere had been created during the initial phase of the AID-funded African Primary Science Programme. SEPA, which formed another phase of AID support to science education in Africa, further spread the goodwill towards problem-solving science education among its members. Indeed, over the years SEPA was requested by numerous African countries to run dissemination workshops for their education personnel. The education leadership in practically all Anglophone Africa was without question favourable to SEPA.

Besides being due to the approach to science education, the salutary stance of African countries towards SEPA rested also on the excellence of SEPA software and hardware materials. They are environment-based. They enable people develop schemes and strategies for evolving educational programmes specifically suited to their ecology, culture and level of development. They mesh into national educational systems, providing "how-to-solve" inputs rather than ready-made answers to the nations' complex education development. SEPA's style of operation also contributed to its acceptance - SEPA worked in partnership with its members. Working jointly with each country's educational leadership, SEPA translated policy into action programmes and helped train staff to implement them.

The AID-supported project on the development of teacher training materials provided materials which are a good vehicle of the SEPA approach. The science educators training course (also funded by AID) produced cadres of trained people each year. And so did the educational evaluation project funded by the Carnegie Corporation of New York. Additional personnel received training during short-term in-country workshops. When combined, these achievements signalled SEPA's readiness to embark on dissemination activity, and it was against this backdrop that in 1980 AID amended the Grant Agreement to add dissemination activities and consultancy.

Objectives

The Fourth Amendment to the grant agreement stated, inter alia:

"A. Article II. B. - Article II. B is amended by adding the following paragraph 5 thereto:

"5. Diffusion and Dissemination activities

The Grantee will further develop its capability to provide information to African countries through such means as editing and producing a multimedia information package: disseminating handbooks, source books and other science materials previously prepared; holding workshops in member countries, and providing staff visitations to national science organizations."

Article III is amended by adding the following paragraph D thereto:

"D. The Grantee may obtain the services of consultants, as needed to support the program activities described in article II, paragraphs B.2, B.3, B.5 above ..."

(Note: B.2 and B.3 are the science educators training course and the education of out-of-school youth activities).

Achievements

Utilizing funds provided under the amended AID grant, SEPA conducted eight in-country dissemination workshops during 1979-81. They were held in Nigeria (1979), Botswana (1980), Ivory Coast (two in 1980), Kenya (1980), Swaziland (1980), Ethiopia (1981) and Liberia (1989). The workshops generally lasted 6-8 days. Although each workshop aimed at disseminating SEPA in the host country, and therefore catered primarily for that country's interests, dissemination leaders from other countries almost always participated.

In each workshop, participants consisted of leaders from the Ministry of Education, Faculties of Education, curriculum and teachers' centres, school inspectorate, in-service teachers committees, training colleges, teachers associations, science panels, examinations boards, and assistance agencies. Representatives of most of these groups play key roles in the selection of school materials. Participation ranged from 17 to 53 people. In addition, a team of seven national and regional resource staff conducted each workshop. The largest workshop (53 people) was held in Ethiopia consisting of 32 Ethiopians and 21 dissemination leaders from ten other African countries.

SEPA has assembled a multimedia information package and a format used during dissemination and diffusion workshops. The package consists of material on (a) the nature of SEPA and its benefactors; (b) SEPA's philosophy and approach to science education; (c) examination and study of products of SEPA programmes and samples of in-country adaptations, (d) how to acquire SEPA materials; (e) practicum on adaptation of SEPA products; (f) techniques of disseminating educational ideas (mass communication techniques, setting up a dissemination centre, records management, solving problems of dissemination); (g) cultivation of mass media to support dissemination; (h) workshop follow-up activities.

Additional dissemination activities include circulation of brochures and of reports of meetings and workshops. Personal participation by the Executive Director and by in-country SEPA leadership at public educational activities and on radio and television have added to the success of SEPA's dissemination efforts. SEPA is also well-known among numerous international bodies which continually request Secretariat staff to play leadership roles in their conferences, meetings and workshops. The Organization of African Unity has consequently granted SEPA a coveted Observer Status. Many of these additional activities are not funded from the AID grant and are, therefore, summarized in Section C of this Report.

Some Desirable Future Activities

Dissemination of the SEPA approach in African schools will be one of the most important SEPA activities in the near future. Having already achieved international fame and respect among professional groups, SEPA plans to create a pervasive awareness and acceptance of its philosophy, materials, and practice in many classrooms in African schools and colleges. To achieve that goal, dissemination activities such as in-country workshops, large-scale publication of SEPA materials and of a newsletter, provision of experienced resource staff will be carried out. SEPA will be seeking funding support for this critically important phase of its development.

Concluding Remark

SEPA's dissemination activities have been very successful. Many requests for SEPA materials and for resource staff participation in in-country workshops have been received by the Secretariat. Other regional African organizations have come to rely on SEPA in the development of science education components of their programming activities. The rise in SEPA membership in the last three years is attributable in large part to SEPA's dissemination activities. Evidence is accumulating that, combined with the publicity arising out of other SEPA activities, the dissemination project has made SEPA the focal institution in science education development in Africa.

II. CONSULTANCY

By design, the SEPA Secretariat is small and consists of no more than two professional science educators. For the implementation of many aspects of its programme activities, therefore, SEPA employs staff of other institutions as short-term consultants. It was in appreciation of this fact that AID agreed to provide consultancy funds for the implementation of certain aspects of the SETC, the out-of-school youth project, and of dissemination and diffusion. In all outreach activities, however, consultants work under the clear leadership of the Secretariat staff. Consultants have been employed to serve as resource staff; during (a) dissemination workshops (b) to perform editorial and graphics functions; (c) to assist in membership drive and in the preparation of SEPA applications for recognition by other regional institutions.

a. Workshop Resource Staff

(i) Ivory Coast. The workshop was for the production and use of low-cost school science equipment. Held during March 30 to April 4, 1980, it brought together primary science educators from Abidjan and Bouake. The SEPA consultants were Dr. Magnus J. Cole of Njala University College and Mr. Sam Amartey, a materi als production specialist at the Science Unit, Accra.

(ii) Botswana. Workshop was for in-service teachers on the introduction of SEPA's environmental education. Held during May, 26-30, 1980, it had two SEPA consultants, namely M. B. R. Savage of the Kenya Institute of Education (a former SEPA Science Education Officer) and Miss Felicity Leburu of the Curriculum Development and Evaluation Department of the Botswana Ministry of Education (a graduate of the SETC).

(iii) Swaziland. Hosted by the Primary Curriculum Unit (in collaboration with the USAID/ Eastern Michigan University Project), the workshop ran from October 10 to October 14, 1980. The consultants were M. B. R. Savage, Dr. Magnus Cole, and Mr. Francis K'Opiyo who is Head of Science Education at Eregi Teachers College in Kenya.

(iv) Kenya. The workshop was conducted by two SEPA consultants, Dr. A.I. Kamara, director of the SETC, and Dr. S.T. Bajah of the SEPA-assisted International Centre for Educational Evaluation. Participants were graduates of SEPA training courses. Workshop duration was November 7-17, 1980 and introduced participants to strategies for developing a national teacher education programme.

(v) Ethiopia. At the in-country workshop held during May 17-25, 1981, Dr. A.I. Kamara, M.B.R. Savage, and Francis K'Opiyo served as resource staff. Dr. Michael Omolewa of the Department of Adult Education at University of Ibadan served as a bilingual consultant.

(b) Editorial and Graphics Services

(i) Preparation of information package. Material was added to existing brochure and "SEPA in the Seventies" to enrich SEPA's information package. SEPA employed services of a consultant - Mr. E. O. Armah, the Deputy Director of the Institute of Journalism, Accra, In addition to the texts, artistic designs were made e.g. SEPA logo, covers for SEPA reports and newsletters. Mr. George Asante, Medical Illustrator and Graphics Designer at Accra's Military Hospital served as additional consultant.

(ii) Publications. Editorial consultants were employed to review written material from the SEPA Review Conference held in Botswana in 1980 and that from the follow-up meeting held in Swaziland in preparation for submission to a professional editor. Prof. B.E.B. Chaytor, director of SEPA's teacher training materials development project, and Professor Anthony Youdeowei, Chairman of the University of Ibadan Publications Committee were employed to edit a manuscript for SEPA entitled "Handbook of Vocational and Technical Education in Liberia" and written by Dr. El Mohamed Sheriff who is a member of SEPA's Representative Council.

(c) Membership and Recognition of SEPA

(i) Membership of Francophone African countries. In the last two years SEPA made strong efforts to promote SEPA in Francophone states in Africa. Because of lack of proficiency in French at the SEPA Secretariat, services of bilingual consultants were obtained. They worked in Ivory Coast, Upper Volta and in Rwanda. For work in Ivory Coast, Lt.-Col (retired) Phanuel Nyaku was employed - he had earlier run SEPA workshops in Brazzaville and Abidjan and had served as Acting Executive Director of SEPA. In Upper Volta Mr. Yanogo Marcel was employed as interpreter. Ivory Coast and Upper Volta have since become members of SEPA. In Burundi SEPA employed Dr. Michael Atchia of Mauritius (Associate Professor of the Institute of Education) to prepare and present SEPA's application for recognition by the Conference of Ministers of Education in French-speaking Africa. SEPA has since received that recognition which will help in the membership drive in Francophone Africa.

In February 1981 SEPA was accorded Observer Status by the OAU. That was an outcome of the work of three consultants, namely, Miss Margaret Tawia, Dr. George Collison, and Mr. H.T. Allison who prepared the basic material submitted to the OAU. The first two are members of SEPA's Representative Council, and the third person is a Principal Education Officer (Science) in the Ministry of Education, Lagos. They also reviewed the SEPA Constitution and programme of activities.

Concluding Remark

Without the consultancy item SEPA's programme activities would have no outreach whatsoever. The very small size of the Secretariat dictates that SEPA employ consultants if it is to meet its objectives. Consultancy was deemed more cost effective as well because it utilizes appropriate human resources in sharply focused activities over relatively short periods of time. It is hard to imagine effective SEPA programming without funds for employment of consultant services.

CHAPTER 7

ADMINISTRATION

The organisational structure of the Science Education Programme for Africa consists of (a) a Secretariat with headquarters in Accra, Ghana; it is administered by an Executive Director (formerly Executive Secretary); (b) a Representative Council and an Executive Committee which serve as direct links between the Secretariat and members of SEPA and also among the member countries. The Representative Council consists of two people from each Member country while the Executive Committee is made up of six members elected from the Representative Council. The Council also elects a chairman to preside over its meetings and those of the Executive Committee.

SEPA receives financial support through subventions from members and through grants from international assistance agencies and private non-profit Foundations. It is a charitable organisation.

From 1970 to 1975 the Executive Secretary served as administrator, manager, programme coordinator, and programme developer. During that period SEPA's financial accounting was contracted to the University of Cape Coast which managed SEPA accounts. A part-time bookkeeper and Mr. Seth Daflagbe - a stenographic staff member at the Secretariat - were responsible for accounting to Education Development Center (EDC) and AID.

From its inception in 1970, the Secretariat was supported from funds provided by AID through EDC and from contributions of member countries. Although minimal in the early years, financial contributions of SEPA members grew steadily and by FY 74 represented 29% of Secretariat costs. These direct contributions by African countries represented a small proportion of their total contribution to programme activities, if one considers their employment of staff to run national science education programmes through which SEPA made its impact at the national level. All the same, by FY 75 subventions from African States accounted for 51% of the Secretariat costs. On the basis of the rising financial contributions from African countries, AID reasoned that SEPA needed limited external support of the Secretariat for a further two-year period.

Objectives of Administration Support

Support for a regional science education development institution in Africa had been motivated by a strong belief that independent national efforts of the smaller nations of Africa could be enhanced significantly by joint action with other nations. Through its coordinating and clearinghouse functions, a regional institution could enrich local curriculum development in order to broaden professional contacts and thereby share ideas. This goal of collective self-reliance gave impetus to the formation and support of SEPA by African countries.

Prior to the formation of SEPA, the linking role was performed by Education Development Center. That arrangement had always been perceived by Africans and Americans alike as temporary until an authentic African institution could be established. SEPA represented a fulfilment of that hope.

The Representative Council is a very important organ of SEPA. Among the essential functions it performed were: (a) the determination of policies and major activities of SEPA; (b) review and approval of SEPA programmes and budgets; (c) study and discussion of reports and data from the Member States of SEPA; (d) appointment of the international staff of SEPA; and (e) assessment of annual membership contributions. Performance of these functions and the exchange of ideas during Council meetings were essential components in the proper functioning and further development of SEPA.

The Secretariat is the heart and soul of SEPA. The entire organization's life hangs on the quality of the Executive Director who is appointed by the Representative Council. Indeed, the external review of SEPA in 1975 concluded that "much of SEPA's success is due to the unique qualities that Dr. Dyasi possesses" (Dr. Dyasi was the Executive Secretary at the time).[15] The Constitution of SEPA pegs the future of SEPA on the Executive Secretary (now called Executive Director) by describing his/her functions as:[16] (a) to act as Chief Administrative and Executive Officer of SEPA; (b) to participate without voting privileges, in all meetings of the Representative Council, the Executive Committee and other committees; (c) to formulate and submit proposals for action by the Executive Committee and the Representative Council; (d) to prepare for submission to the Executive Committee a draft programme and corresponding budget; (e) to prepare and distribute in accordance with requirements established by the Representative Council periodic reports on the activities of SEPA; (f) to appoint staff members in accordance with regulations approved by the Representative Council; (g) to accept on behalf of SEPA gifts, grants, bequests and other forms of financial assistance in accordance with policies determined by the Representative Council; (h) to take such other action as may be delegated by the Executive Committee or the Representative Council.

In 1975 African States could meet only half of the Secretariat budget costs. Without an efficient Secretariat or meetings of the Representative Council, SEPA would collapse. The Council meetings provide a forum upon which African States can express their goals. and objectives in sciencea andtechnology education and l evelop workable mechanisms for adoption by SEPA. They area lso an effective communication channel for the Secretariat to describe, explain and gather support for new programming ideas. The two-way communication ensures that SEPA programmes are not only understood and appreciated but also remain truly relevant to the needs of African countries. It is on these bases that Members are willing to make their annual contributions, release professionals on short-term basis for SEPA activities, and employ staff to incorporate the SEPA approach into national education programmes.

Because SEPA enjoyed goodwill in Member countries, because Representative Council members were very eager to pursuade their countires to meet all the Secretariat

costs in future, and because it was prudent and also more cost effective to support an African rather than an American institution, AID decided to include funding of some administration items in the grant to SEPA. There were two other reasons for AID's positive stance. In its 1976 final report to AID on the African Science Education Project, EDC commented that "the process of establishing SEPA as a recognized international body to which contributions could be made by governments was more complex and time consuming than anyone imagined. Ultimately, intercession by officials at the highest levels of government was required in nearly all countries."[17] Also the external review report had recommended continuation funding to the Secretariat.

Scope and Amount of Secretariat Support

The grant Agreement outlined the manner in which the SEPA administration and organization would be strengthened: "The efficiency and effectiveness of the SEPA Secretariat will be strengthened by the establishment of a new position of Program Specialist, the establishment of an Accounts Section, and by providing a source of U.S. periodicals and other professional literature on science education. Assistance for this activity will also include support for the salary, housing and travel costs for the planning and conducting of a biennial Representative Council Meeting and Council follow-up activities."[18]

It was envisaged that more African countries would become increasingly committed to SEPA and science education development in Africa, and thus support the Secretariat fully within two years after the grant came into operation. Consequently, AID support to the secretariat would phase out in FY 78.

In dollar figures, AID support to the Secretariat would be $105,602 spread over FY 76-78. This amount was later increased to $170,800 by extension of the grant to cover the first three months of FY 79. The components of the assistance were (a) support for salary, housing, and travel costs of the Executive Secretary and of the Programme Director; (b) other costs, including subscriptions to professional journals and purchase of commodities such as calculators and a safe for the Accounts Section; (c) costs for a Representative Council meeting in 1976 and Council follow-up activities in 1977. Correspondingly, SEPA's proportion of support of its own Secretariat would increase from 43½ in FY 77 to 54% and 67% for FY's 78 and 79 respectively. After FY 78 SEPA would support Council meetings from its own funds, and from FY 80 onwards, would provide entire support to the Secretariat.

Grant Effects

The professional staff of the Secretariat during FY 76-81 is shown in Figure 8. In June 1976 Mr. Edmund T. Cole, Chief Education Officer of Sierra Leone took up the position of Executive Director. Mr. Cole had participated in African Primary Science

activities since 1965 and had been a founding member of SEPA. He had served on the Representative Council member of SEPA for six years. As provided in the AID grant, a portion of his salary and all his housing and travel costs were paid by AID.

The appointment of a high Ministry of Education official coincided with a perception expressed privately by some AID officials and by Dr. Hubert Dyasi (the preceding Executive Director) that SEPA needed an Executive Director who was a professional science educator and also a colleague of high-level Ministry of Education officials. Such a person would be seen by Ministry officials as knowledgeable of, by virtue of his experience, and able to function effectively within the framework of civil service etiquette. With one of their number as Executive Director of Sepa, so the logic went, responsible officials in Ministries of Education of SEPA member countries would be more pursuasive in obtaining their countries financial contributions to the Secretariat. The result would be a self-sufficient Secretariat within three years.

In Septemeber 1976 Dr. Dyasi agreed to return to the SEPA Secretariat to fill the newly established position of Director of Programmes. He had previously opted out of the position of Executive Director. His entire salary, housing, and travel were financed through the AID grant.

Also using funds from the grant, in August 1976 SEPA organized and conducted a Representative Council meeting. Fourteen English-speaking African countries participated. Two AID staff also attended. Among the items discussed were desired increases in contributions of Member States, support of on-going programmes by international agencies, and election of new members to the Executive Committee. Council follow-up activities consisted of a small meeting held in Freetown, Sierra Leone, during 27-29 April 1977.

From its own resources SEPA continued to rent a house as its offices. It also continued to provide suitable office furnishings and equipment and supplies. SEPA also raised funds to meet running costs for telephones, cables, correspondence and utilities. SEPA utilized its own funds to employ Mr. A.F.E. Moore as Administration/Fiscal Officer and established a fully operational accounting facility at the Secretariat. Mr. Moore had been an accountant at the University of Cape Coast where SEPA accounts were originally located. The Accounting Section was, therefore, transferred from the University of Cape Coast.

Figure

SECRETARIAT PROFESSIONAL STAFF 1976-81

NAME	1976	1977	1978	1979	1980	1981
A.L. Kamara[1]	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXX		
E.T. Cole	XXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXX		
H.M. Dyasi[2]	XXXX	XXXXXXXXXXXX	XXXXXXXX			XXXX
M.E. Addy[3]			XXX	XXXXXXXXXX		
R.O. Alabi[4]				XXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX

1. Director of the Science Educators Training Course since 1974
2. On leave of absence from September 1978 to August 1981
3. Was temporary Director of Programmes and Acting Executive Coordinator of OCSY project.
4. Executive Director

The USAID Mission to Ghana assisted in the establishment of documentation procedures to substantiate expenditures in accordance with accounting principles and practices recognized and accepted in the United States of America. The Mission also furnished SEPA with some accounting equipment. Using funds provided through the AID grant SEPA purchased a safe.

Mr. Seth Daflagbe who has worked for the SEPA Secretariat from the time of its establishment in Ghana serves as Office Manager and is paid from funds raised by SEPA. Miss Veronica Tobias has been with the Secretariat since 1975 and serves as secretary; her salary and fringes are paid from SEPA funds. Also employed and paid independently of the AID grant are maintenance and custodial staff.

In March 1979 Mr. Cole left SEPA due to ill-health. Dr. Rufus O. Alabi was appointed Executive Director commencing August 1979. Dr. Alabi had been selected among many applicants with excellent credentials. At the time of his appointment, he was Associate Professor of Biology at the University of Illorin and was Vice-President of both the Science Teachers Association of Nigeria and the Worldwide International Council of Associations of Science Education. He had earlier been a lecturer in teacher training colleges in Nigeria and served as Secretary of the West African Association of Science Teachers. He had also co-authored a primary science series - DOING SCIENCE and published by the Oxford University Press.

Through monies provided for in the AID grant, SEPA bought subscriptions to several American scholarly journals. Among them were the Review of Educational Research, The American Educational Research Journal, Journal of Teacher Education, Science Education, Journal of Research on Science Teaching, School Science and Mathematics, and the Harvard Educational Review. The Secretariat also receives numerous journals and newsletters from various organizations and institutions. This literature has been invaluable to the professional staff of the Secretariat.

During FY 77-80 financial contributions from Member countries became regular. The corresponding figures were $40,825, $50,726, $58,410 and $81,077 respectively. Membership also rose from 8 in 1976 to 16 in 1981. At the time the AID support to the administration of SEPA phased out, contributions of SEPA members were rising signalling a preparedness by African countries to bear all the Secretariat's administrative costs. And this upswing was occurring at a time of increased economic difficulties in many African countries.

These data indicate that AID's support of some administrative items of the SEPA Secretariat yielded valuable dividends. By buying time, AID enabled SEPA members to gather sorely needed momentum in their support of the Secretariat. As a result, SEPA member countries were able to meet all the expenses of the Secretariat in FY 80 and in FY 81.

SECTION C

SUMMARY OF OTHER SEPA ACTIVITIES

PROGRAMME ACTIVITIES

1. Educational Evaluation Centre

Centre established by SEPA in collaboration with University of Ibadan; trains educational evaluators at post-graduate level (diploma, masters and doctoral); sister Course to AID-funded SETC. Trained over 124 educators. Evaluation Centre conducts reviews for SEPA on contractual basis; carried out research studies.

Major funding by Carnegie Corporation of New York, supplementary funding from University of Ibadan, Ford Foundation, Commonwealth Fund for Technical Cooperation, German Foundation for International Development.

2. Environmental Education

Under contract with UNESCO, SEPA developed multi-media material for primary education cycle teachers; in French and English; for all of Sub-Sahara Africa. Package consists of teachers guides, children readers, charts, slides, film strips, evaluation techniques, visual aids manual, etc. Part of world-wide UNESCO/UNEP project on environmental education. SEPA has been member of UN inter-agency group on development of environmental education; participated in World Congress on environmental education in Tbilisi in 1977. SEPA contributed chapter to the UNESCO/UNEP book on environmental education.

3. Concept Development

Carried out under contract with UNESCO; research oriented to study child development in Africa, acquisition of scientific concepts by children in Africa, relating learning to child development, teacher training and child development, environmental factors and child development in Africa. Produced research papers on clinical studies; produced book (funded by UNEP): The Child in African Environment for International Year of the Child, book covers physical environment, child development, services for children, cultural environment, and new ways of meeting children's needs.

4. Dissemination

SEPA used own funds to conduct pilot dissemination workshop in 1978; outlined a strategy and framework for dissemination of SEPA approach and materials; Funding furnished by CFTC; countries participated. SEPA also supplemented AID-funded dissemination activities.

5. Follow-up Workshops

Brought together graduates of SETC and Evaluation Courses; provided exchange of experiences, feedback to project's staff, and developed dissemination plans. Major funding by Carnegie Corporation, additional funding by CFTC and DSE. Produced reports.

6. Polularization of Science

Mainly out-of-school science activities for schoolgoing children; conducted planning workshops for leaders; participants from Francophone African countries. Funding from UNESCO and supplemented by African states through contributions to SEPA.

7. Science Education Review

Conduct of review of science education in Africa during period 1960-1980; two components: research into science education activities and an All-Africa conference to study review report and make plans for next ten years. Produced detailed studies on science education in 15 countries. Two-volume report produced. Funded by Carnegie Corporation of New York; conference funded by African States through subscriptions to SEPA, and by DSE. Observers from OAU, UNESCO, USAID, ECA, UNEP, DSE, EDC, ICASE, ACO, WHO.

8. Representative Council and Executive Committee

SEPA conducted Council meetings using subscriptions of African States; meetings held in 1978 (Liberia) and 1980 (Swaziland). Executive Committee meetings held in 1978 (Liberia), 1979 (Sierra Leone), 1980 (Kenya), and 1981 (Ethiopia). Studied, reviewed, and approved SEPA programmes and activities.

I. COLLABORATIVE ACTIVITIES

9. UNESCO Education Office (Africa)

Collaborated with UNESCO Office for Africa in Dakar on development of integrated science, out-of-school science activities and in elementary science. Also collaborated on formation, development, and evaluation of the Network of Educational Innovations for Development in Africa (NEIDA) - a joint UNESCO/African States organization at UNESCO Office for Africa, SEPA serves as a focal institution for NEIDA.

Several papers on elementary science education written by SEPA Secretariat professional staff who also participated in programme planning meetings of UNESCO.

10. IUCN

Secretariat staff work collaboratively with International Council on Conservation of Nature and Natural Resources (IUCN) - a world wide confederation on environment, conservation, and education. Programme Director serves on IUCN Commission on Education.

11. ICASE

SEPA has been collaborating with Worldwide International Council for Associations of Science Education (ICASE); participated in all its workshops and meetings since 1973. Programme Director wrote papers and chapters for ICASE's publications. SEPA Executive Director is Vice-President of ICASE. ICASE links major science teaching associations throughout the world.

12. ICSU

SEPA has worked very closely with the committee on the teaching of science - a subdivision of the International Council of Scientific Unions; SEPA materials are often referred to in ICSU conferences; Executive Director is member of committee on science teaching.

13. UNESCO and CASME

UNESCO has collaborated with the Commonwealth Association of Science and Mathematics Educators to encourage science teacher education. SEPA has been centrally involved in their activities and Dr. Kamara (SETC director) has written papers for and chaired some of the UNESCO/CASME seminars; Kamara serves on CASME Executive Committee.

14. Commonwealth Secretariat

SEPA has collaborated with the Commonwealth Secretariat (London) in African science education over several years; CFTC provided fellowships for SETC and for training in educational evaluation; CFTC provided funds for first SEPA dissemination workshop in 1978; Programme Director played leadership role and wrote leading papers for Commonwealth workshops on production of low cost science equipment in Africa and in the Pacific regions of the Commonwealth. Practically all English-speaking Africa belongs to the Commonwealth.

15. African Curriculum Organization (ACO)

SEPA consultants and staff have worked on ACO intensive training workshops to introduce the SEPA approach and materials to curriculum developers. Consequently, numerous African countries are requesting SEPA to help them design and implement their primary science programmes.

16. German Foundation (DSE)

SEPA collaborates with the German Foundation for International Development to conduct workshops on primary science education in Africa. DSE sponsors participants and SEPA furnishes resource staff.

III. OFFICIAL RECOGNITION OF SEPA

17. SEPA enjoys official recognition by key African Organizations. For example, the Organization of African Unity granted SEPA an Observer Status thus qualifying SEPA to function as a specialized agency in science and technology education; Observer Status grants consultative status to SEPA vis-a-vis OAU. Consequently SEPA Executive Director serves on OAU Scientific Committee.
SEPA also recognized officially by Conference of Ministers of Education of French-speaking African countries.
SEPA has been an unofficial focal institution for UNESCO on primary science education in Africa. SEPA has now applied for official recognition.
None of these association has politicized SEPA.

18. Membership to SEPA has doubled in the last four years - another sign of increasing official recognition. Membership includes Francophone States.

19. SEPA played leadership role in the organization and formation of the Forum of African Science Educators - a federation of Science Teachers Association in Africa.

FOOTNOTES

1. AID/EDC Contract afr-791 for the support of the African Primary Science Program 1971-1976. May 28, 1971

2. Quoted in letter to SEPA Executive Secretary from Principal Secretary, Ministry of Education, Accra, Ghana. 18th December, 1972.

3. Theodore D. Benjamin and John J. Koran, Jr.: End of Project Review, SEPA/EDC/APSP. Overseas Liaison Committee, American Council on Education, Washington, D.C. November 26, 1975

4. Ibid.

5. AID Grant Agreement with SEPA. Grant No. 698-0390. December 9, 1976.

6. Education Development Center: Final Report on the African Primary Science Program Implementation Phase 7/1/71-6/30/76. Newton, Massachusetts. June 30

7. D. E. B. Chaytor: "SEPA's Development of Materials for Teacher Training." Fourah Bay College, Freetown. December 1979.

8. Benjamin and Koran: op. cit.

9. Education Development Center: op. cit.

10. Quoted in Education Development Center: op. cit.

11. Quoted in C. O. Agbenyega: Training Science Educators for Africa. SEPA, Accra. September, 1975 p.10

12. UNESCO: Final Report. ED/MD/41. Conference of Ministers of Education of African Member States. Paris, 14 June 1976.

13. loc. cit.

14. loc. cit.

15. Benjamin and Koran: op. cit.

16. SEPA: The Constitution of the Science Education Programme for Africa. SEPA Secretariat, Accra, Ghana. pp. 11-12.

17. Education Development Center: Final Report on the African Primary Science Program Implementation Phase 7/1/71-6/30/76, Contract No. afr-791. Education Development Center, Newton, Massachusetts, June 30, 1976.

18. AID Grant Agreement with SEPA. Grant No. 698-0390. December 9, 1976.

APPENDIX I

SELECTED SCIENCE EDUCATION DISSERTATIONS

1975.

Awiti, Caleb R. : An Assessment of the Potentialities of Leaves and Small Animals as Teaching Materials for Upper Primary Classes.

Chanda, S. W. : What is to do Science ? A Comparative Study of the Major Distinctions between doing Science and learning about Science.

Clarke, Gertrude N. : Reaction of Lower Primary Pupils to Discovery Science Approach.

Gyang, Mary: Analysis of Questions asked during Classroom Interactions in Science Lessons.

Katende, Abraham S. : Developing A Science Curriculum for Lower Primary Classes in Uganda.

Nyambe, B. : Problems Associated with Introduction of the Activity Approach in Primary Schools.

1976.

Fonnah, Davidson J. S. : Basic Concepts and Strategies Underlying the Implementation of an Innovation.

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Manda, P. C. : A Close Look at Activity Science with a View to Diagnosing its Efficacy and Suitablity.

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APPENDIX B

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8. AGIOBU-KEMMER, R.S.G., Chief, Federal Ministry of Education, Lagos.

9. AHMED, Geeli, Ministry of Education, Mogadishu, Somalia.

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11. AKINFENIWA, I., Director of Archives, University of Ibadan, Ibadan.

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APPENDIX III

REPORT ON AID FUNDED ACTIVITIES

1976, August, 18-23, Representative Council Meeting, Nairobi, Kenya

1977, March, Out-of-School Youth Workshop, Njala, Sierra Leone

1977, July, Out-of-School Youth Workshop, Cape Coast, Ghana

1978, July, Out-of-School Youth Workshop, Monrovia, Liberia

1978, July, Follow-up Workshop for past SETC & ICEE students, Njala(SL)

1978, December, 13-16, Representative Council Meeting, Monrovia, Liberia

1978, December, First Dissemination Workshop, Monrovia, Liberia

1979, January 15-26, Out-of-School Youth Workshop, Mombasa, Kenya

1979, September, Out-of-School Youth Workshop, Nakuru, Kenya

1979, December, 16-21, Dissemination Leaders Workshop, Ibadan, Nigeria

1980, March, Dissemination Workshop, Abidjan, Ivory Coast

1980, May, 20-25, SEPA Review Conference, Gaborone, Botswana

1980, May 26-30, Implementation Workshop, Francistown, Botswana

1980, October 10-14, In-country Workshop, Manzini, Swaziland

1980, November 17-27, Follow-up workshop for past SETC & ICEE students Nairobi, Kenya

1981, May, Dissemination Workshop, Addis Ababa, Ethiopia

1981, June, Out-of-School Youth Workshop on the Agricultural Change Agent, Banjul, The Gambia

1981, September 20-26, Out-of-School Youth Workshop, Dar es Salaam, Tanzania

1981, December 7-17 Out-of-School Youth Workshop, Ibadan, Nigeria

APPENDIX IV

SUMMARY OF EXPENDITURE BY LINE ITEM

JULY 1, 1975 - DECEMBER 31, 1981

SECRETARIAT	US$ 171,193
SCIENCE EDUCATORS TRAINING COURSE	250,230
TEACHER TRAINING MATERIALS DEVELOPMENT	29,666
OUT OF SCHOOL YOUTHS PROGRAMME	202,140
DISSEMINATION ACTIVITIES	73,941
CONSULTANCY	22,406
	US$ 749,576