AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch 77

1. SUBJECT CLASSIFICATION

A. PRIMARY: Education — JF20-0000-G100

B. SECONDARY: Elementary education--Africa

2. TITLE AND SUBTITLE

Evaluation programme

3. AUTHOR(S)

(100) Yoloye,E.A.
(101) Education Development Ctr.,Newton,Mass.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1968	25p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS

EDC

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

10. CONTROL NUMBER

PN-AAF-231

11. PRICE OF DOCUMENT

12. DESCRIPTORS

Africa
Education,elementary
Evaluation
Project evaluation
Science education

13. PROJECT NUMBER

14. CONTRACT NUMBER

CSD-772 Res.

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

Csd-772 Res.
EDC
PN-AAF-231

EVALUATION PROGRAMME

E. A. Yoloye
Coordinator of Evaluation

APSP

Produced under the auspices of the African Primary Science Program, Education Development Center, Incorporated, Newton, Massachusetts, U.S.A., operating under US/AID Contract No. csd-772

EVALUATION PROGRAMME

P R E F A C E

This volume deals with the overall philosophy and design of the evaluation programme for the African Primary Science Programme. A companion volume entitled "Source Book on Evaluation" contains details of the papers and instruments referred to in this volume.

Both volumes will be subjected to revision as evaluation activities get under way and data accumulate.

E. A. Yoloye.

INTRODUCTION

Discussion groups on evaluation often remind one of the six blind men of Hindustani giving their descriptions of the elephant after each had explored a different part of the animal with his hands. To the one who had felt its sharp tusk, it was like a spear. To another who had felt its massive side, it was like a wall. To yet another who had felt its wide soft ear, it was like a leaf. The elephant was in fact all of what they described and a lot more. So it is with evaluation. Evaluation has such a variety of facets that a thorough exploration is necessary in order to get a full picture.

After two major meetings of the APSP evaluation group, a reasonably clear picture of the scope of evaluation for this programme is emerging. The first major meeting was in Akosombo, Ghana in the summer of 1967 and the second was in Nairobi, Kenya in January 1968. The outputs from these two meetings have been compiled into separate reports, copies of which are available at E.D.C. In between the major meetings, continuous exploration has been carried on particularly with respect to collecting research information which might be relevant to APSP evaluation.

Some things have become quite clear during the exploratory period. First, a worthwhile evaluation is going to involve a lot more than the traditional administration of science achievement tests to experimental and control groups. New techniques of evaluation would have to be developed. For this reason, the Evaluation project must be regarded as a research and development project in much the same way as the African Primary Science Programme itself is a research and development project.

Second, because of the many facets of evaluation involved and the extensive geographical area over which the programme is operating, considerable team work is called for. The evaluation team has to consist on the one hand of people with the specific competencies required for the different facets of evaluation and on the other hand of people suitably located in the participating countries to facilitate data collection.

Third, the role of evaluation in the selling of the programme may not be as major as it oringally appeared to be. The main factors that seem so far to have influenced the establishment and adoption of APSP in the African countries are:

(1) The involvement of the policy makers from the Ministries.

(2) The absence or quality of competing programmes initiated or supported by the Ministries.

(3) Diplomacy.

In fact in some countries, notably Kenya and Tanzania, the problem of the science centres is to produce enough materials quickly enough to meet the demands of the ministries.

The implication of all this is, therefore, that the major role of evaluation may be to inform the producers themselves of the worth or otherwise of what they are producing. Considering the amount of energy, time, and money invested in this programme, there can be no doubt that the producers (E.D.C., Science Educators and counterparts, US/AID, Ford) intend to produce something worthwhile. It is a major duty of evaluation to help in the production of such worthwhile material.

As far as selling is concerned, evaluation may serve to reinforce the already converted. For the unconverted, the production of an appealing variety of visible materials, (teachers guides, children's readers, cheap equipment. etc.) may be far more significant than evaluation statistics.

RATIONALE

There are clearly two broad but not mutually exclusive dimensions of evaluation that need to be considered.

1. Evaluation of the programme.
2. Evaluation of the achievement of the individual child in the programme.

Evaluation of the Programme:

An essential characteristic of APSP at this stage is what has been termed "Research and Development". No science unit is considered ready for use in schools until it has gone through several classroom trials and modifications. As older units go through trials and modifications, new units are proposed and developed. Consequently, at any one time, the programme consists of a number of science units in various stages of completion. This state of affairs calls for two kinds of evaluation.

First, there is the kind of evaluation which guides and aids development. This has been variously referred to as developer - author - publisher oriented evaluation (Stake)[1] and formative evaluation (Scriven)[2].

Second there is the kind of evaluation which gives judgement as to the value or worth of the finished product, in this case the Primary Science Curriculum. This has been variously referred to as consumer - administrator - teacher oriented evaluation (Stake)[1] and summative evaluation (Scriven)[2].

In view of the comments made in the introduction concerning the role of evaluation, formative evaluation seems to be what can be most usefully concentrated upon at present. Besides the programme has not yet produced what may be called a curriculum.

---

1. Stake, Robert E. "The countenance of educational evaluation," Teachers College Record LXVIII. 7 April 1967, pp. 532-540.
2. Scriven, Michael. "The Methodology of Evaluation," AERA Monograph Series on Curriculum Evaluation. No. 1 Chicago: Rand McNally, 1967 pp. 12-17

Summative evaluation of the finished product is therefore not feasible yet. However, formative evaluation would involve on a limited scale some summative evaluation. Thus there may be summative evaluation of completed units on certain criteria of excellence, which would be useful in the production of subsequent units.

Techniques developed for formative evaluation will also be very useful for the over all summative evaluation when that time comes.

Evaluation of the Achievement of the Individual Child:

Evaluation of the child's achievement may again be of two kinds.

First, it may be guidance-oriented; i.e., it may be such as to help in identifying the child's needs for help and guidance.

Second, it may be selection-oriented. Many of the countries in which APSP is in operation have primary school leaving certificates which are issued on the bases of performance on an achievement examination at the end of the primary school course. The examination is usually based on subjects which the children have been taught in school.. Thus science would be one of the subjects on which such an achievement test may be desired. Such examinations constitute selection-oriented evaluation in the sense that the resulting certificate may form the basis for selection into other institutions of learning, vocational training and employment.

There can be no doubt as to the importance of guidance-oriented evaluation at this formative stage. It is one to which a lot of energy should be directed.

Selection-oriented evaluation poses a more serious problem. It carries a heavy loading of threat not only for the child but also for the programme because of the well-known undesirable interaction between examination syllabuses and classroom work. Yet such evaluation cannot be simply ignored. In

a country like Ghana which has decided to do away with primary school examinations, APSP is in a fortunate position. In others where the emphasis on primary school examinations is still high, the ministries would probably go ahead and develop their own science achievement tests anyway whether APSP gives guidance or not. It therefore seems reasonable that APSP evaluators should devote some attention to this kind of evaluation so as to provide adequate guidance if need be to the ministries.

The Scope of Evaluation:

What needs to be evaluated with respect to the programme may be divided into three categories.

1. Antecedents. These are the various conditions existing prior to the introduction of APSP in the various countries both in terms of the child and his environment.
2. Transactions. These are the various strategies by which the programme is being carried out.
3. Outcomes. These are in general the consequences of the programme.

Table 1 gives details of what each category involves. (See page 6.)

The Role of Intents and Observations

In setting up of standards for judgement in evaluation, one obvious way is to identify intents or objectives and then carry out observations to see to what extent the objectives have been fulfilled. There are two reasons, however, why this must not be the only approach to evaluation of APSP. First, some unplanned-for outcomes may be just as desirable and/or significant as planned-for ones.

TABLE 1

Antecedents Transactions and Outcomes

ANTECEDENTS	1. Administration: Finance of Education; School Population; Syllabuses; Examinations; Text Books; Media of Instruction 2. Children's Background: Socio-economic; Cognitive 3. Economic and Manpower resources: Quantity and Quality of teachers; Facilities for Teacher Training; Resources for Science Teaching 4. Prospects after Primary School: Further Education; Employment; Selection Procedures
TRANSACTIONS	1. In the Class Room: The Nature of Materials for Science; Teacher - Class - Material Interaction 2. At the Administrative Level: Development of Materials, Teacher Training; Interaction with Ministries and Universities; Building up of Indigenous Personnel
OUTCOMES	1. Impact on the Child: Acquisition of Scientific Knowledge; General Intellectual and Social Development 2. Impact on Society: Sociological; Economic

Second, APSP units are only semi-structured. The structuring is only at the beginning. They are then meant to lead into an open-ended situation. The result is that the expected outcomes of each unit, particularly from the cognitive point of view cannot be catalogued in detail.

The technique of comparing observations with intents will therefore need to be supplemented with more open-ended techniques which can take into account unexpected observations.

To begin with, however, a list of intents or possible implications of the programme have been prepared with respect to Interactions and Outcomes as follows.

Intended Transactions[1]

A. In the Classroom

1. The focus of study should be the concrete phenomena themselves

   e.g. plants, animals, stones, liquids, stars, shadows, etc. First hand experience with materials is essential.

   The phenomena of the natural and man-made world are complex. They have different significance for different people. Telling about them does not carry all their complexities and fascination. Nor does "telling about" them alone allow opportunities for children to develop ability and confidence in finding out for themselves.

2. The materials selected should capture and hold the attention and interest of children

   In some cases, the materials may be sufficient in themselves to suggest things to do. In some cases, questions and suggestions from the teacher are necessary to reveal interesting possibilities which the children may not have thought of themselves. In some cases alternatives should be available for children with divergent interests

1. Akosombo Evaluation Report, Appendix 2

3. The materials should reveal that there is not always one right answer.

This can be at a variety of levels. At one level, children may arrive at different answers to the same question and all the answers may be equally acceptable. At another level, the teacher often will not be able to answer questions that arise, and there is no other way to find out in the classroom except by carrying out an investigation. At another level, questions may arise to which no one can find an answer, and, to which, indeed, no one in the world yet knows the answer.

4. Materials should allow opportunities for a variety of different ways to find out - some patient watching, some resourceful tool making, some clever experimental design, some sudden insight, some constant repetition, some imaginative guessing, some tight logical thinking, some trying at a tentative idea, some frustration, some recourse to other people, books, radio, film, etc.

5. The classroom experiences should lead to social interaction among children - where they develop a common body of experience; accept and respect other points of view; attempt to substantiate their own points of view; cooperate to solve problems together.

6. To a large extent, the materials should be simple and familiar - so the children's experiences outside school are met here in a fresh way. This in itself may develop the awareness that the children can continue their investigations on their own in everything they do. More directly, some materials may take the form of setting out to work on a problem that comes from outside school such as health, care of food, cooking.

B. At the Administrative Level

1. Materials should be developed which correspond to the above characteristics at science centres.

2. Tutors in teacher training colleges and ministry officials who work directly with teachers should be familiarised with the materials and encouraged to participate in the development.
3. Teachers must be taught in the same way that they are expected to teach in that they must be given the occasion to find out for themselves, to develop confidence in what they know, to appreciate that there are many unanswered problems and to realise that they can continue to learn and revise while they teach.
4. Teachers must be supported through follow-up visits, advisory services, discussions among teachers and provision of concrete and written materials.
5. Primary school science curricula should be made flexible enough to allow for continued change and improvement as the program and the teachers develop.
6. A training scheme should be devised for creating a corps of indigenous people within each country who will be capable of carrying on the curriculum development work on their own.

Intended Outcomes (The Child)[1]

APSP should contribute to the production of the following characteristics in children.

1. Knowledge of a variety of biological, physical and man-made phenomena in the world around them.
2. Interest in further exploration of the world around them on their own initiative.
3. Ability to find out for themselves - to see problems and to be able to set about resolving them for themselves.
4. Confidence in their own ability to find out for themselves and do things for themselves.

1. Akosombo Evaluation Report, Appendix 3

5. Ability to share in a common development of knowledge through collaborating in problems, telling, listening, and discriminating of second-hand sources.

Possible Outcomes (Society)[1]

Table 2 shows the possible implications for the individual, community and society from the sociological point of view. Table 3 shows the implications from the economic point of view.

---

1. Extracted from a paper by F.O. Okediji, Nairobi Evaluation Meeting Report Vol. I, attachment V.

TABLE 2

Possible Implications for the Individual, Community and Society

1	2	3
Individual	Community	Society
1. Ability to conceptualize and discover problems; creativity; an inquisitive mind even when clear-cut goals are not yet given; capacity to define new problems that establish new needs and goals for action	1. Making of local entrepreneurs	1. Manpower needs fulfilled in industry, education, technological organization, commerce, government, etc.
2. Thinking logically (model construction)	2. Making of community leaders activating community initiative in the manufacture of locally-made scientific equipment	2. Changes in the value system of the society-less emphasis placed on tradition
3. Self-reliance and desire to reach excellence	3. Improving the standard of living of the people in the community	3. Improving the standard of living of the society in general
4. Receptivity to ready-made concepts and information, and better means to attain already given and accepted goals		4. Efficient allocation of resources; and also more efficient utilization of local resources
5. Career opportunities in agriculture, medical technology, teaching of science, industrial and commercial occupations, game management, etc.		5. More efficient operation of public bureaucracies

TABLE 3[1]

Economic Implications for the Society, Family and Individual

Costs	Benefits
Society	
1. Quantifiable:	1. Quantifiable: NIL
Experimental costs, associated with research and development: costs of teaching materials, books, demonstration tools and materials; stationery and administrative expenses; cost of additional school building facilities; costs of training and retraining teachers	2. Non-quantifiable:
2. Non-quantifiable:	Effects of local manufacture of teaching units on local initiative and entrepreneurship; a probable increase in the holding power of primary schools; greater equipment of pupils for post-primary employment; better preparation of pupils for secondary schooling; the pupils greater understanding of his environment and hence his greater impact on the society
Opportunity costs involved with a possible rise in the primary school cycle	
Parents	
1. Quantifiable direct costs:	1. Quantifiable direct benefits: NIL
Impact on parental budget in terms of increases in school fees, cost of equipments and books. (These however are costs already born by society as a whole and the payments involved on the part of parents are merely transfer payments to the society of which parents are a part.)	2. Non-quantifiable direct benefits:
	An increase in the financial ability of the primary school graduate to support his parents; the educative effect of the pupil on the family; healthy developments in the attitude and behaviour of the child towards his parents and family
2. Quantifiable indirect costs:	3. Quantifiable indirect benefits: NIL
The longer waiting period of certain parents and family for support by the primary school graduate who may now have to stay longer at school; possible adverse turn in the child's attitude towards financial support of parents and other members of the family	4. Non-quantifiable indirect benefits:
	These are derived from benefits already listed under the non-quantifiable benefits accruing to society and the benefits accruing to the child

[1] Extracted from a paper by O. Teriba, Nairobi Evaluation Meeting Report, Vol. I, attachment VI.

TABLE 3

Economic Implications for the Society, Family and Individual

Costs	Benefits
Parents	
3. Non-quantifiable direct cost: NIL	
4. Non-quantifiable indirect costs: Possible adverse turn in the child's attitude and behaviour to parents and within the home i.e. in terms of domestic help, ineffective and ineffectual control, etc.	
The Child	
1. Quantifiable direct costs: NIL	1. Quantifiable direct benefits: Increase in average earnings
2. Non-quantifiable direct costs: NIL	2. Non-quantifiable direct benefits: An increase in his understanding of his environment; better preparation for social life
3. Quantifiable indirect costs: NIL	3. Quantifiable indirect benefits: NIL
4. Non-quantifiable indirect costs: The opportunity costs involved in a prolonged stay at school	4. Non-quantifiable indirect benefit: Better preparation and equipment for post-primary employment and education

INSTRUMENTS AND STRATEGIES OF EVALUATION

A number of instruments and strategies have been selected for the evaluation of the programme as well as children's achievement in the programme. Some of these instruments and strategies are ready to be put into operation right away. Others need further development and pretesting. Some are only ideas at this stage.

Evaluation of Antecedents

An evaluation of antecedent conditions is particularly useful for the planning of strategies of transactions. Evaluation effort in this respect will consist in the provision of summarised information from time to time about the variables comprising the antecedent conditions in various countrie Such information will be primarily for science educators and counterparts at the various science centres, and will include such items as (1) Student/teacher ratios, (2) Teacher training facilities, (3) Qualifications of teachers, (4) Finance of education, (5) School organisation, (6) Employment and further education prospects, etc. Such information will be accompanied by evaluative comments much of which would be of a subjective nature although some objective intercountry comparisons will be drawn.

Sources of information will be mainly (1) Annual Reports of Education, and (2) Annual Statistics of Education for the various countries. These would be supplemented by other relevant government publications and occasional questionnaires. Educational research information will be collected from journals, etc

Evaluation of Transactions

A. In the Class Room

1. Task Analysis of trial units to identify concepts, skills, observations, etc. they teach (see Appendices 1-6 of Nairobi Evaluation Meeting.)

Information coming out of Task Analysis will be particularly useful for (a) revising of units, (b) selecting of units for form curriculum, (c) indicating areas where more units are needed and (d) construction of achievement tests for student guidance. These are all important aspects of formative evaluation.

2. Teacher - Class - Materials Interaction Analysis

Three instruments are under trial here (a) a modification of Flanders interaction analysis (appendix 5 Akosombo Report); (b) Individual child observation (Appendix 6 Akosombo Report) and (c) Budd Rowe's Interaction analysis. (Appendix 12, Nairobi Evaluation Report) These instruments when fully developed and perfected should prove useful for evaluating teacher performances and aiding teacher training.

3. Determining Children's Interest in Science

A procedure for estimating how much APSP science invoked in children is outlined in Appendix 9 of the Nairobi Report.

At the Administrative Level

1. Determining Teacher Reactions to APSP

Two questionnaire-rating scales for assessing teachers reactions to (a) In-service programmes and (b) Units they have taught, have been developed. (Appendices 8a and 8b Nairobi Report Vol. II)

2. Micro Teaching Studies

This is a technique using Budd-Rowe's interaction analysis to evaluate teacher child interaction during science classes. Trials of this technique in one or two centres should yield valuable information for teacher training.

3. Experimental Study of Optimum Teacher Qualifications

This is for effective functioning in APSP teaching. Experimental procedure for this study is described briefly in attachment VIII of the Vol. 1 Nairobi Report.

4. Evaluation of Progress on Local Manpower Build-up

Regular surveys of build-ups in centres will be taken and these will be evaluated against expectations considering extent of adoption and implementation of APSP in participating countries.

Evaluation of Outcomes

1. Achievement Tests:

Based on teask analysis, achievement tests which can be built into each unit will be constructed. In addition, a guide for construction of tests to suit APSP will be prepared.

2. Striking Incidents:

A technique for taking account of unforeseen outcomes is suggested in Appendix 7 of the Akosombo Report. Information from the striking incidents forms should not only help to identify unpredicted outcomes but also give some indication as to attributes of various units which can guide the selection of units into a curriculum.

3. Experimental Study of Changes in Aptitudes:

A second technique of identifying some predicted as well as unpredicted outcomes is by the administration of a differential aptitude test battery. These tests would be administered to experimental and control groups at intervals over a given period of time. The aptitude scores of experimental groups would be compared with those of the Control Groups to see if significant differences exist.

For this purpose the I.D. aptitude tests developed by the Nigerian Aptitude Testing Unit (now the International Test Development and Research Office) will be used. These tests were standardised on West African and East African samples although most extensive use of them has been made in West Africa.

Of the 21 tests in the series, nine would be useful and practicable for our purpose considering the level of literacy in English in the primary schools. They are shown in the table below.

TABLE 4

I. D. Aptitude Tests

Test No.	Title	Administration Time (in minutes)	Purpose
1	SIM	35	Concept formation
4	RDL	30	Reading comprehension
7	MEC	35	Interest and aptitude for technical occupations
8	CHK	10	Perceptual discrimination
9	BOX	40	Three-dimensional visualisation
10	FIG	20	Flexibility in responding to changing perceptual cues
19	MAN	15	Speed and coordination of arm and hand movements
20	FIN	15	Speed and dexterity in precise finger movements
21	MRK	15	Speed in performing simple repetitive tasks
		3 hrs. 35 mins.	

4. Materials Information Sheet:

With respect to economic implications of APSP, a materials information sheet to be filled by science educators for each unit has been designed (Appendix 10a of Nairobi Report Vol. II). These would be useful for evaluating the additional cost for schools adopting APSP.

Further Evaluation Studies

Little has been done so far in designing detailed studies for evaluating the impact of the programme on society. This is because such studies will necessarily be more complex and, in terms of priorities, it is felt that the child and the teacher should be considered first in an evaluation programme. However, there are a multitude of interesting and informative studies on this important aspect of impact on society which should be undertaken in the near future. The papers by F. Odekiji and O. Teriba (attachments V & VI of Vol. 1 of Nairobi Report) contain several ideas for such studies.

Several studies concentrating on particular effects of the APSP approach may also be done. For example studies of the relative functioning of "bright" and "dull" pupils in APSP units. A pilot study of this aspect has already been carried out at the Department of Education, University of Ibadan.

ADMINISTRATIVE ARRANGEMENTS

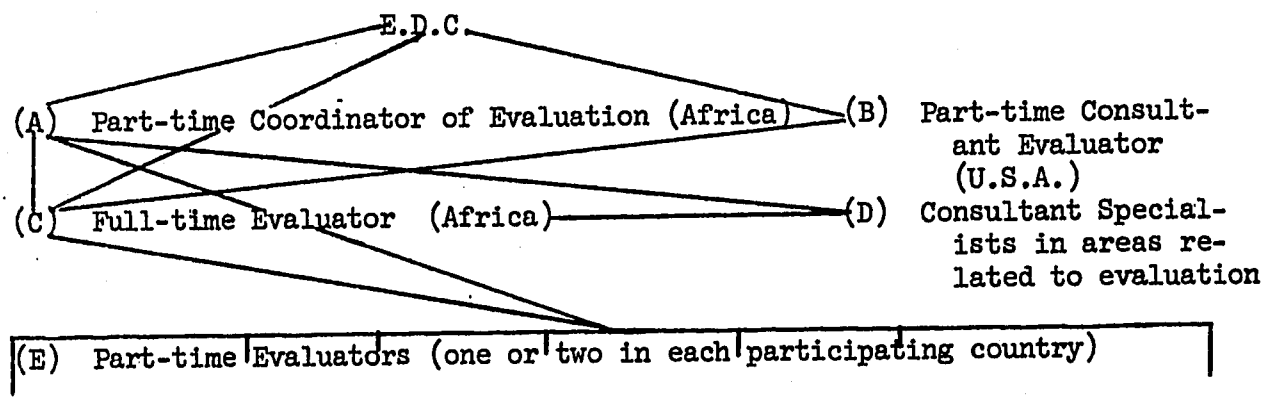
Communication of Evaluation Information

It should be quite clear from the foregoing that evaluation in the APSP context is not regarded as a once-and-for-all affair. It is envisaged as an on-going concern with initial emphasis on aiding the research and development of the programme.

In the circumstances, it is essential to constantly feed back evaluation information to the curriculum developers. For this reason, there should be a quarterly evaluation bulletin in which such information will be recorded and circulated. A compilation of the various issues of this bulletin will yield a fairly comprehensive report of the evaluation of APSP.

Evaluation Personnel

The following administrative set-up for the effective prosecution of evaluation activities is proposed:



The coordinator of evaluation has been listed as part-time simply because this is the way the set-up has developed so far. There is, however, need for somebody to work full time in collating evaluation information from the various countries, hence a full-time evaluator has been proposed to work with the part-time coordinator. This full-time evaluator should be located

preferably in the same place as the coordinator (Ibadan) but could also conceivably be in Nairobi since most of the proposed studies are likely to be most feasible in the East African countries. The important thing, however, is that, the full-time evaluator should be very mobile and so able to travel from one centre to another if need be.

The part-time evaluators in the various countries should be preferably but not necessarily Africans. The reason for this is the necessity to ensure continuity. Already three such people have been identified. They are Dr. Youn of Sierra Leone, Mr. Collison of Ghana and Mr. Otalla of Uganda. Science Educators like Dr. Lapp, Uganda and Dr. Dyasi, Sierra Leone, if trained in evaluation, can also function in this capacity.

Consultant specialists are people like Okediji and Teriba who can contribute scholarly information in areas related to evaluation.

What is Presently Being Done

Some of the evaluation activities are already in progress. Four of the completed units already have been task analysed and others are being tackled. Micro teaching studies already have begun in Nairobi. Trials of the interaction analysis instruments are going on in Sierra Leone (Njala) and Nigeria (Ibadan).

The following table summarises the evaluation activities now in progress and indicates where they are going on.

TABLE 5

APSP Evaluation Activities in Progress

Activity	Place							
	Ken.	Ugan.	Tans.	Ghana	S.L.	Lag.	Ibad.	Mal.
Task Analysis	X	X	X	X	X	X	X	X
Micro Teaching	X							
Test Construction							X	
Striking Incidents	X	X	X	X	X	X	X	X
Classroom Observation					X		X	
Sheets from Trial Teachers	X	X	X	X	X	X	X	X
Teacher Reaction Form	X	X	X	X	X	X	X	X
Teacher Reaction After In-Service Training	X	X	X	X	X	X	X	X
Materials Information Sheet	X	X	X	X	X	X	X	X
Studies of Functioning of Bright and Dull Pupils in APSP							X	

The Task Ahead

1. Appointment of a full-time evaluator and part-time country evaluators
2. Tackling of the evaluation activities not yet begun.

At this point, it is useful to point out that all the work need not be done by the evaluation team alone. Several of the evaluation studies can be taken up by higher degree students in education and the social sciences for their research and thereby supply valuable information for the programme. A number of universities in Africa have such students and they should be encouraged to contribute in this way.