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THE AFRICAN PRIMARY SCIENCE PROGRAM -
A REPORT ON FIELD VISITS

by
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FIELD VISITS

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1. Objectives

Some of the principal ^{field} sites of the African Primary Science Program (AFSP) ~~primary~~ were visited prior to evaluation by the AID Research Advisory Committee of the proposal to continue this program for a final two-year period (July 1, 1969 - June 30, 1971) as an experimental development and study project under contract with the Educational Development Center, Newton, Massachusetts. First-hand information was to be gathered on the progress of the program to date, on the nature of the problems with which it was faced, and on the effectiveness of past and proposed approaches, in order to assist the Committee in advising the Agency with regard to funding this extension.

2. Program of Visits

Sites of program activities were visited jointly with Dr. J. David Laird, US/AID - African Regional Bureau, in Tanzania and Kenya, and by myself in Ghana.

January 14-15, 1969: Dar-es-Salaam, Tanzania. US/AID Mission;
Ministry of Education; Science Development Center; Tanzania
Headquarters - East African Teachers Program, Columbia University,
Teachers' College; one primary school.

A.I.D. HISTORICAL AND
TECHNICAL REFERENCE
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January 16-17, 1969: Nairobi, Kenya

US/AID Mission; Ministry of Education; Kenya Institute of Education; University College, Nairobi; Teacher Training Colleges at Kagumo and Kamwenja; Science Development Subcenter, Kagumo; Kikiciku and Mutadini primary schools.

January 20-21, 1969: Accra, Ghana.

US/AID Mission; Ministry of Education; Science Development Unit; Ajumako Teacher Training College.

3. The APSP in Brief

Science in the elementary school curriculum of the English-speaking countries in the sub-Sahara belt is still represented for the most part by subjects such as Nature Studies, Hygiene, Gardening, etc. The APSP has set out to create the basis on which it can be decided in what form, in what amounts, and in lieu of what present activities science will ultimately appear in the schedule. Pertinent insight is being developed by experimenting with ways of making the fundamental ideas and viewpoints of science come to life in an African school child's experience.

The curricular building block with which the project works towards this end is a "unit": Along with the appropriate classroom materials, it provides for something like 2 to 6 lessons' worth of exploratory occupation with a particular subject, involving the physical handling of pertinent materials by the pupils themselves in a reasonably independent experimental manner. To function well in the classroom environment which this requires, a teacher must have a good background in science and be trained in appropriate pedagogical methods. Moreover, he should have absorbed the spirit of science to the point where he is not afraid to admit ignorance and to engage in exploration jointly with his pupils; - in short, he must lead his class not by authoritarian discipline but by wisdom and integrity. From the

beginning, it was clear that to explore the training of such teachers would have to be a priority concern of the program. It turned out later that also the development of a satisfactory unit requires much work and - especially - time. Its experimental use in a variety of settings reveals ever new shortcomings which must be eliminated in successive revisions or local adaptations. Teacher training and unit development were therefore the main preoccupations of the program during the four years since its inception, and they must continue to occupy a place of high priority.

It is one of the project's basic tenets that the development of science curricula for injection into the school program is a local affair. Accordingly, it has stimulated the establishment in each of the participating countries of a Science Development Center or Unit under the Ministry of Education and in close contact with the university community. Its duties include the development and adaptation of units for local classroom use, instruction and supervision of the experimental use of such materials, and the initiation of teacher training activity. Each of them is staffed by one or several EDC staff members, along with African counterpart personnel (Science Educators) from the local Ministry and some supporting technicians to help with the shop work. The principal such centers, presently in operation, are located in the visited countries; others are in Malawi, Nigeria, Sierra Leone, and Uganda. In all of these countries, some of the activities that their centers have catalyzed are going well, while others are frustrated by one or another local inadequacy. The resulting disparity between the various country components of the program now begins to raise problems, especially for the wind-up phase.

One important source of this divergence is, of course, the large country-to-country difference in available resources which cannot be easily

overcome. Of equal importance, however, appears to be the tenderness of the program's relation to the individual ministries of education which has a decisive influence on its local progress. This "anchorage at the top" will have to become of primary concern during the final two years.

4. Unit Development

At all three of the centers visited, work on the development and adaptation to local conditions of units was going forward productively and with enthusiasm. Moreover, this is truly an inter-center effort with much exchange of ideas and drafts. The envolving portfolio of units certainly provides a solid base of materials for the introduction of science in the elementary school curricula throughout the participating countries and may well be of use elsewhere in the world, - of course with suitable adaptation in illustrations, basic materials, etc. There are now in print some 20 units on the lower primary level and some 6 to 8 each at the middle and upper levels. This number will reach a total of 40 by summer 1969 and is to be increased to 70 by the end of the program: This is considered to provide a starting reservoir of enough material with enough choice for any complete science sequence through the elementary years. Its experimental improvement and evolution is looked upon as an essential and continuing part of the long term curriculum development effort.

The units are used experimentally under the general supervision of the centers (or, like in Kenya, subcenters) in actual classroom situations to obtain feedback for further development. Only Tanzania was found to be on the verge of going beyond this form of use to a more nearly operational introduction. They are also used extensively in teacher training, - both in-service and pre-service.

In short, the mechanism of the Science Development Center, staffed at its present level of competence and with its regionally cooperative

modus operandi, has proved to be most effective for the preparation of satisfactory curriculum units.

5. Teacher Training

The teacher training efforts of the APSP serve the dual purpose of gathering insight and experience on how to achieve in teachers the ability of functioning in activity-oriented science education and of training, in the process, a group of teachers who can participate in the curriculum development by putting the experimental units to the test of classroom use, as well as in other ways. The program operates naturally in both, the pre-service and the in-service arena, - the relative emphasis depending in each country on indigenous conditions.

In Tanzania, where the elementary teacher force consists of better than one half grade A teachers (secondary school graduates with two years of Teacher Training College) and will be maintained at no less than this threshold, the teacher training effort has been mainly concentrated on the Teacher Training Colleges with the one at Morogoro in the lead. The latter had just graduated its second class of qualified teachers in APSP science. The TTC tutors throughout the system have been exposed, and all of the training colleges have been requested by the Ministry of Education to issue certificates to all graduates whom they consider qualified to teach this form of science: 300 such certificates were issued at the end of the just concluded school year. It is at this point where a more nearly operational introduction of APSP curriculum materials is being launched, aside from their further developmental exploration. We shall return to this in the next section.

In Ghana, about 20 of its better than 80 Teacher Training Colleges have become involved in the program, training their own students and working with the teachers in their vicinity who are venturing the use of

APSP units in their classrooms, - having been trained to do so by what appears to have been a particularly successful recent workshop. A decisive point in the program will be reached when these training colleges graduate, in the near future, the first wave of qualified teachers. At the college visited, the APSP work was conducted with eager support, from both faculty and students alike, and with impressive success.

In Kenya, the TTC-s graduates constitute at present only about 10-15% of the annual replenishment, required in the elementary teacher force because of the great pressure for increased educational opportunities. It is therefore clear that great reliance must be placed on arrangements for in-service training, if and when a substantial number of schools are to start introducing APSP units into their curricula. At present, there is little activity on the teacher training front. Workshops have been used to bring aboard the necessary teachers in those schools that are working with the two sub-centers, currently being operated at some distance from the Nairobi district in order to broaden the range of classroom settings for trying the materials. Both of them are in jeopardy of folding under the proposed plan for the program's continuation, leading to an actual contraction of the project base in Kenya. Nor was there, at the time of the visit, any substantial involvement of Teacher Training Colleges in the program.

6. Ministry of Education and University Involvement

Ministry officials must be concerned with and knowledgeable about the program, Ministry employees make up the Africa counterpart staff of the Science Development Centers, and the program plan envisages the latter as having close contact with the university community. Striking differences in these matters were found in the visited countries, with decisive impact on the individual programs. In many cases, shortfall from this blueprint is

due to an inadequate supply of qualified people. The only solution for remedying this in less than generation-sized steps is a systematic utilization of opportunities for university training abroad, - especially the UK and the US, combined with proper employment of the returnees. The prompt and thorough exploration of this approach was therefore recommended. Other contributing factors showed greater country-to-country variability.

In the Ghanaian Ministry of Education, the ties to the program are in particularly competent hands. Its implications for the educational system, especially as regard its long term demands on TTC faculties, are well understood. The young University of Cape Coast, with its emphasis on education, is expected to produce not only secondary school teachers but also teacher training tutors with university degrees; at present there are none in the system. In turn, the deliberate but steady broadening of the APSP base in Ghana is soundly geared to the educational system as a whole. Moreover, the counterpart staffing of the Science Development Unit is of high quality.

Effective coordination is provided under the aegis of the Ministry among the various assistance programs in science education, - especially between the UNESCO/UNICEF and US/AID supported activities: The minibus caravan furnished by the former also helps in getting APSP materials to the schools and assists Science Development Unit staff in their efforts to make in-service teachers familiar with them. A similarly cooperative spirit characterizes the outward look of the Ministry: Cooperative arrangements for the production of APSP materials, once their use in Ghanaian schools becomes extensive, would therefore be most welcome.

In Tanzania, on the other hand, there is a firm commitment to the installation of an elementary science program at maximum speed with minimum aid, - reluctantly accepted. In the absence of any even

approximately suitable alternative, this program hews to the APSP line with purposeful adaptation to Tanzanian conditions. In particular, Swahili rather than English is used throughout. There are now ready for use by the certified teachers who have entered the system the first of this year, 26 units covering Standards 1, 2, 7, and 8. They are issued to the teachers with recommended grade level and sequencing; in principle, however, the teachers are free to deviate from the recommendation or to introduce other units. Also, each of the certified teachers was about to be issued a kit of materials, assembled with Chinese, UK, and US technical assistance, - the latter through the US/AID Mission at Dar-es-Saalam.

The Science Development Center has done yeomen services in accomplishing all this, and it has recently been strengthened by increasing the EDC complement from 1 to 2. The counterpart staffing, however, is inadequate, and - unless this is remedied during the next two years - there might be a considerable hiatus at the end of the project.

Good relations tie this effort to the East Africa Teachers Program of Columbia University's Teachers College, and the interface between APSP and the developing secondary school curriculum in the sciences is being worked out thoughtfully. The latter, too, is based on an activity-oriented form of classroom instruction; the materials, however, are chosen from the viewpoint of what the student needs to know, rather than from the viewpoint of what allows most instructive pupil exploration. The problem now under attack is that of getting the Ministry's inspectors informed about the substance, the operation, and the needs of the program. A workshop, scheduled for the near future, with training college tutor for regionally designated lead-inspectors is to set this process in motion. The latter, in turn, will then instruct the inspection staff in their districts.

Tanzania, the Ministry of Education claims, has its own philosophy and its own needs; it expects therefore to produce its own materials. There is little thought given nor much inclination to participate in an Interafrican organization to supply to curriculum development what is now supplied by EDC.

In Kenya, finally, Ministry of Education relations to the African Science Project have become somewhat attenuated in recent months. This appears to be due mainly to shifts in key personnel, as well as the integration of The Curriculum Research and Development Center, of which the Science Unit was a part, with the Kenya Institute of Education under the management of the latter's director. Curriculum reform was carried out under the so-called NPA (New Primary Approach) program in English language instruction and is now rolling in Mathematics. Science will follow in due course, and teacher training is identified as the principal problem. It will be attacked by following the pattern of in-service programs that were used in the NPA language reform and which - it is reported - left no little confusion and ineptitude in its wake.

The insensitivity of the Kenya Ministry of Education to the science program was indicated by two straws in the wind: The failure to provide counterpart staff and suitable TTC back-up for subcenters at Kagumo and Siriba, so that no continuity is foreseen for them following the departure of the EDC employees who are now assigned to them, and secondly an order from the Ministry that either had or was shortly to be issued and which would close the Teacher Training Colleges as well as the model schools attached to them to the further use of experimental materials.

In none of the three countries has the APSP effort received substantial participatory contributions from the university community. This remains an important concern for the remaining two years of the project.

7. The Role of the US/AID Missions

In both Ghana and Kenya, it seems that the US/AID Missions are being adequately, albeit summarily, informed about the APSP activities in their respective countries. Education Officers are following these activities with understanding and occasional timely support of both administrative and material character. Monthly reports from the Science Development Center keep US/AID Nairobi abreast of the latter's progress, while in the case of US/AID Accra occasional personal contact with the Education Officer provides for adequate contact. In contrast, some improvement is needed in Tanzania. The irritation of US/AID Dar-es-Salaam with certain non-routine aspects of the program (lack of timely information about the goings and comings of EDC staff, unusual procurements under the contract (such as beads, toys, etc.), difficulty of fitting progress during a given period into the format of Technical Evaluation Reports which the Mission is required to prepare) is not counter-balanced by a corresponding sense of joint interest in what is happening when and why.

It is of importance in this context that the rapport of the Mission with the project be at least as good as with the Ministry of Education. Without needing to come between the Science Center and the Ministry, the Mission will thus be able occasionally to enhance the project's contribution to the educational endeavor of the country and certainly not be led inadvertently to question or even hinder it. This is especially important in a situation such as the one in Tanzania where US/AID relations with the Ministry are not always of the easiest. The approaches that have been found to work in Ghana and Kenya should be examined for their applicability here. It is suggested that, as a minimum (unless this is done already), the Quarterly Reports by EDC on the program be distributed to the Missions in all participating programs.

8. Summary Appraisal

It is now firmly established that the principal ideas, on which the APSP is based as a research and development project in curriculum reform, can be made to work in the African environment, and the results are coming in:

- Satisfactory units are being developed cooperatively by the Science Development Centers, as they have been organized, and an adequate portfolio of such units will be on hand by mid 1971 to allow the construction of entire science curricula or the selection of appropriate sequences for inclusion into the curriculum.
- Teacher training methods for the education of pre-service teachers have shown encouraging success in the training colleges of Ghana and Tanzania, and good progress is being made in developing the workshop approach for in-service teachers, as evidenced by the experience of last summer in Ghana.

The development of proper "anchorage at the top", - especially in the Ministries of Education and wherever possible, in the university community must be added to the priority concerns during the last two years.

This must go hand in hand with a real effort to expand the country-to-country coherence and cooperation within the program as it deals with an increasing number of aspects of importance in curriculum reform. Regional cooperation in the preparation of units has been exemplary and productive from the start. The development and testing of methods to evaluate the performance of APSP instruction in the classroom is about to get underway on a cooperative basis among all participating countries. Comparable

emphasis needs to be given to cooperative ventures for the sharing and consolidation of the knowledge and experience that is accumulating in the garment teacher training endeavors throughout the participating country programs. The apparent lack of activities, scheduled by the extension proposal for this purpose, and the absence of funds allocated to it, must be remedied.

Continued efforts should also be made to achieve and maintain close and current rapport between the Program and the US/AID Missions in the participating countries. This will enable them to be instrumental, individually, to achieve the required improvements in the "anchorage at the top" and, by their regional orientation, in furthering country-to-country cooperation. They can contribute in this manner to bring the program to the threshold of operational implementation during the next two years, preparing them to play their inevitably pivotal role thereafter.

Consideration should also be given to revising the drastic reduction of the EDC staff in Kenya, if this should really entail the closing down of the two subcenters at Kagumo and Siriba.

With these provisos, presented for Research Advisory Committee discussion, the African Primary Science Program is considered to warrant funding for the proposed two-year extension.