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REPORT

to the

AGENCY FOR INTERNATIONAL DEVELOPMENT

on the

1965 KANO ELEMENTARY SCIENCE CONFERENCE

Conducted by

Educational Services Incorporated

Watertown, Massachusetts 02172

under

AID Contract No. csd-772

April 9, 1965

REPORT ON AFRICAN ELEMENTARY SCIENCE CONFERENCE, KANO

February 22-26, 1965

Part I

The African Education Program of Educational Services Incorporated was proposed at the Endicott House Conference in 1961 and brought into existence soon after. The Conference proposed that programs of curriculum development in mathematics, science and social studies should be undertaken as soon as seemed appropriate. The Mathematics project was initiated in 1962, and early in 1964 with the help of funds from the Ford Foundation a beginning was made with the Elementary Science program. The outcome of this preparatory work in Science was the Conference held in Kano, Northern Nigeria, from February 22 through 26, 1965.

The purpose of the one-week conference was to plan for possible major changes in the teaching of beginning science in Tropical Africa -- primarily for English-speaking Tropical Africa. Of the sixty participants, more than one-half represented African countries -- the remainder were largely from the U.S. with a few from the U.K. (Appendix I - Kano Participants).

The meeting took the form of presentations, classroom demonstrations, and great discussions. The presentations were started by Dean A. Babs Fafunwa and Mr. John H. Gitau; they described the kind of work that is going on in centers in Nsukka and in Nairobi. There was also a presentation by Mr. E. R. Wastnedge. Mr. Leonard Sealey from Leicestershire and Dr. Philip Morrison gave talks concerning basic education philosophy of the new science programs. Participants from other countries made useful and considerable contributions to the subsequent discussions.

In addition there were demonstration classes. Mike Savage, who has been with the Elementary Science Study for several years, is in Africa associated with the Nsukka center. He went to Kano a couple of weeks ahead of the meeting and worked for a total of six teaching hours with six African teachers. These teachers (with only eight to twelve years of schooling) then learned to teach units of the Elementary Science Study, in particular "Batteries and Bulbs" and "Pendulums". The training period of the teachers was not sufficient to make them fully at home with the materials, or to bring them to a full

understanding of the aims of the units being taught. Nevertheless, for the benefit of the participants, they gave demonstration classes with local children, and it was evident that they and the children gained much from the lessons, and were enthusiastic about this approach to learning.

Every bit of this -- the presentation, the classes, everything -- served to clarify not only the thinking of those members of the conference who were new to the Elementary Science Study, but to help clarify the thinking of all of us who have been working so long in this sort of education. There was general agreement concerning the educational philosophy to combat the deadening effects of rote and memory. There was such uniform agreement on all educational issues that it was decided to have the statement of educational philosophy drafted by one man, namely Mr. Leonard Sealey of the British group (Appendix II - Conference Report).

After three days the conference divided into six groups: one representing the five parts of Nigeria; one for the countries of East Africa; one for Ghana; one for Sierra Leone and Liberia; one for the countries south of East Africa -- Rhodesia, Zambia, the High Commission territories; and finally a group composed of the U.S. and U.K. members. The participants reassembled to a meeting of the whole with substantive and administrative proposals. We agreed that the two centers in Nairobi and Nsukka should be increased in size immediately. In addition, there was agreement that there should be started, in many parts of Africa, smaller centers which should be encouraged to grow -- eventually to have the kind of scope that E.S.I. has (Appendix III - Regional Reports).

The role of E.S.I. in all of this is to develop and assist in the development of elementary school science materials and to provide some of the means for the setting up of the centers -- namely help to provide new people for these centers, a supply of materials, people on exchange, and people for replacement. Every other form of assistance that we could think of was discussed, and examples were given (Appendix IV -- the Centers).

For immediate action, the group as a whole agreed to a summer Workshop to be held this summer at Entebbe (to be directed by Dr. Jack S. Goldstein, an atrsophysicist from Brandeis University). Preparation of new materials will not be the sole purpose of the Workshop. The science project is very different from the mathematics project in that the science project starts with many good experimental materials to try.

There was limited discussion of some miscellaneous, but nonetheless important experiments in the field of beginning science. Dr. P. Morrison's plan to try to get science materials to young children and children out of school was discussed and pretty much agreed to. It was felt that there should be investigations to make possible the supply of simple material likely to be interesting to small children, into a small area which could be easily supervised and in which the effect of the experiment could be estimated. It was also considered well worth while to assist with suitable equipment for secondary school science clubs which satisfied previously stated criteria. These discussions did not continue to the end of the conference. There was also some discussion on making books and reading materials available to African schools at low cost (Appendix V -- Megabooks).

The Conference ended on Friday evening with a short but rousing banquet, which itself indicated the extraordinarily high morale of the entire week.

On Saturday representatives of the mathematics project met with ten A.I.D. field representatives, and this will be reported in a separate Report. They presented a careful schedule of the mathematics activities, but most important from the point of view of the science study, they discussed the changeover from innovation to implementation. The A.I.D. field representatives had attended the final two days of the Science Conference.

On Saturday, representatives of the African Elementary Science group met with the A.I.D. personnel and discussed the outcome of the conference. At this meeting a fuller description of the aims of the Science program was given and the detailed reports and plans of the regions were discussed.

Outside of the conference, but nonetheless germane to it, were some discussions concerning the establishment of an overall umbrella organization that might be called Educational Resources Africa (E.R.A.). The need for such an African organization, with a location in Africa, to undertake the task of initiating and supervising educational reform in Africa had been discussed at some length at the original Endicott House conference.

During the five-day meeting many other points were clarified in general discussions. These discussions have made it possible to make some fairly firm

predictions on the method the African Elementary Science Program will use and the period in which the program will operate. It is also possible to make a very rough estimate of the probable total cost of the program. These predictions and estimations are given in Part II.

Part II

It was evident from the Kano meeting that there is a desire to innovate a program for the improvement of science curricula. Both the Africans and others who attended the meeting showed a great deal of enthusiasm for this type of long-range science development program. The momentum needed to initiate any type of development program which is based on a different approach to learning was much in evidence. As can be seen from the regional reports given at the meeting (Appendix III) the stage of development and the preparedness to follow through on the initial phases varied from country to country. Thus, any long-range plans have to be flexible enough to meet the needs of the various countries. However, the following is a proposal which provides the guidelines for initiating such a program to meet the different possibilities expressed at the Kano meeting. This section is organized in response to the specific points included in the Contract (Section A.3.(b)).

1. Long Range Strategy and Plans

The program will be under the overall direction of the Steering Committee. Their prime responsibility will be to follow the program as it develops and to see that its activities respond to changing needs and accumulated experience.

To lay a sound foundation for this program, two important needs are the development of a small group of people acquainted with new approaches to science teaching in each country, and an organization around which this core group can disseminate the ideas to the other members of the educational system.

It was indicated at Kano that the best method to do this would be to operate Science Workshops during the summer vacation periods, and to assist in the development of Science Centers in the countries involved. The Workshops would engage in a number of activities which include the following:

- the development of guidelines for an elementary science curriculum;
- the preparation of text materials and laboratory experiments appropriate to the African environment and to African financial and industrial resources;
- coordination of the programs being conducted in the participating countries.

A Workshop organized to meet these objectives would provide the necessary coordination and interchange of ideas to support the efforts of the people from each of the local centers. The first Workshop is to be held during the summer of 1965.

The core group which attended the Workshop could act as a nucleus in each country for carrying on the work during the intervening period. In some cases, such as Nsukka and Nairobi, this would mean working from an established center, in other cases it would mean working on a smaller scale based at the home institution of the participant. This might be a university of teacher training institute. An effort would be made to encourage the various countries to set up centers as soon as feasible. A reasonable amount of assistance would be provided for these centers as the country was prepared to undertake this activity. It would be hoped and was predicted that a suitably prepared core group from each country would be ready to carry on this activity without the need for continuing Workshops by 1971.

The African Education Program would provide U.S. and U.K. scientific and technical staff to the centers. This staff would develop and/or modify experimental materials, supervise experimental use of the materials and feedback, and provide contact with the Ministries and teachers using the new materials.

2. Co-ordination of Project Activities

The activities of the program will be under the overall direction of the Steering Committee. Personnel attending the Workshop and working in Science Centers will be required to keep the Steering Committee and appropriate E.S.I. staff representatives fully informed of local activities. In the initial planning, provision has been made for consultants to travel in Africa to supervise and help the work in the centers and to coordinate the work in major areas. In addition provision has been made for staff visits of E.S.I. personnel. The main purpose of these visits is to maintain close contact with the work and ensure co-ordination of effort. These visitors, supported by Workshop reports and materials received from centers and disseminated by E.S.I., will keep people involved fully informed of the project's activities and ensure that the work in the centers combines to further the aims of the program.

3. Coordination with other Science Curricular Efforts in Africa

The Science Centers will be a co-operating country venture through which E.S.I. will operate in that locale. The full co-operation of the relevant education officials in each co-operating country is a pre-requisite for E.S.I. utilization of the center for science curriculum material development. Co-ordination with other science curriculum projects in Africa will thus be achieved through the center to the extent the officials in each case include the materials of these projects in their center operations. In addition E.S.I. staff will be in constant communication with other projects in Africa where relevant efforts will be made to achieve full cooperation.

4. Indigenous Educational Institutions (Initial Local Research and Development Efforts)

In the initial phase of the program there would be a need to involve the Ministry of Education officials, staff members of local Institutes of Education, Senior Training Colleges and science staffs of the Universities. These various groups from each country would become involved as the program develops in each country. In all instances this program would have to have the cooperation of the Ministry of Education officials. This cooperation would be explicit in the willingness to send people to the first summer Workshops. In many cases this cooperation was assured at Kano. Again, the degree of involvement during the first year would vary from country to country. The Nairobi Teaching Center would be the location of the development work for Kenya. This center is already established. In this case the Ministry as well as the University would supply personnel to carry out the development activities at the center. The personnel selected for this work would be in attendance at the 1965 Science Workshop in July and August. Nigeria is another country where the initial center can be identified. The University of Nigeria at Nsukka has already started a program and any expansion of effort would be through this institution. In other countries the initial effort might be through a teacher training institute. For instance, in Malawi the initial effort would probably be through the Domasi Teachers' College, since the Ministry sent a man from this institution to Kano and is planning to have him attend the Workshop. In Basutoland the initial effort would be through the University, since one of the science faculty attended the Kano meeting and is already undertaking a modest program. Liberia has drawn up a proposal for establishing a Materials Center under the direction

of the Ministry of Education. It is evident from this emerging pattern that the initial effort will vary from country to country. In time it is hoped that there will be one super-center that would be a coordinating center for all the country centers, but this would not evolve until the need is clarified and it is requested by the various participating countries. The following is an indication of the institutions that have already indicated an interest in the program:

The University of Njala in Sierra Leone;
Cuttington College and the University of Liberia in Liberia;
The University College of Science & Education at Cape Coast in Ghana;
The University of Nigeria at Nsukka in Nigeria;
The University of Ibadan in Nigeria;
Ahmadu Bello University in Nigeria;
The Institute of Education, Makerere University College, at Kampala, Uganda;
The Science Centre, Nairobi, Kenya;
The University College of Dar-es-Salaam, Tanzania;
The University of Malawi, Malawi;
Chalimbana Teacher Training College, Zambia;
The University of Rhodesia and Nyasaland, Salisbury, Rhodesia;
The University of Bechuanaland, Basutoland Protectorate and Swaziland at Maseru, Basutoland.

5. Estimate of Manpower Required for each Country

The countries able to coperate in setting up a science center will be expected to attempt to provide the personnel as listed in Appendix IV. It is expected that in many countries local involvement will be at a higher level, and that available and interested African scientists will take an active part in the work of the centers. Kenya, Eastern Nigeria, Western Nigeria, Ghana and Liberia may develop in this way within the next twelve months.

At another level of participation, there will be people attending the Workshop who come from countries unable to have science centers immediately. These participants, with the support and interest of their institutions and

ministries, will be able to experiment with the materials developed at these Workshops and report back either to neighboring centers or to the next Workshop. At this stage of the development of the program Basutoland, Malawi and Sierra Leone may well be in this category for two or three years. Northern Nigeria, Uganda, Tanzania and Rhodesia may develop more quickly.

6. Grades included in the Program

Grades to be covered will be Kindergarten through Grade 7. It may be necessary to try materials at the higher grades to better determine the pedagogic and substantive needs of the earlier grades.

7. Other Relevant Proceedings of the Kano Conference

In addition to the foregoing the Conference discussed and approved:-

(a) A controlled experiment in an easily supervised area to observe the effect of distributing to children at pre-school age, materials and things of an interesting nature, which might help to develop suitable attitudes to scientific thinking.

(b) The creation of a science park area where large apparatus using sound scientific principles could be made available for use by children.

(c) The supply of suitable equipment to selected secondary schools which have Science clubs meeting previously laid down criteria of ability and interest.

All of the above would provide insight into the most fruitful way to develop the scientific literacy of the Africans. They would provide meaningful experiences in the utilization of materials, the absence of which is believed to handicap the African child in his studies of the sciences. Controlled experiments would be established to determine the validity of this thesis and provide information pertinent to the development of science materials for schools.

ESTIMATED COST OF THE RESEARCH AND DEVELOPMENT PROJECT,

April 1965 - April 1970

5 - Year projection

Eng Nairobi Dar - Angola Freetown

NaNigeria

Science Centers (build up to do in 5 years)	$1,560,000
Supervising Consultants	200,000
Workshops - 5 - moved from country to country	930,000
Program Direction and Administration	390,000
Publication and Production of Materials	295,000
Total	$3,375,000
Estimated overhead	371,250
Grand Total	$3,746,250

Depends on success -

could double

£125,000 per cent

Target cost

APPENDIX I

African Elementary Science Meeting - Kano

LIST OF PARTICIPANTS, February 23, 1965

ABUBAKAR, Dr. Iya	Ahmadu Bello University, Zaria, Nigeria
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KASS, Dr. Edward H.	Director, Channing Laboratory, Boston City Hospital, Boston, Massachusetts, U.S.A.
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MILLS, Mr. J.W.L.	Deputy Chief Education Officer, Ministry of Education, Accra, Ghana
MITCHELL, Dr. Neal B.	Associate Professor, Department of Architecture, Harvard University, Cambridge, Massachusetts, U.S.A.
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MORRISON, Dr. Philip	Department of Physics, Cornell University, Ithaca, New York, U.S.A.
OKIGBO, Dr. Bede	Department of Plant/Soil Science, University of Nigeria, Nsukka, Nigeria
OMONDI, Mr. J.I.	Senior Science Inspector, Ministry of Education, Nairobi, Kenya
PINCHIN, Mr. Malcolm	Soche Hill College, Limbe, Malawi
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E.S.I. Secretaries

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MORSE, Miss Barbara A.	do.

Hudson Travel

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April 1, 1965

Appendix II

12-65

Conference Report:

by Leonard Sealey

Now that the Kano Conference is over it is necessary to consider again the words that were said and try to understand their meaning.

From the very first moment it was clear that this was a conference about children. Although "African Elementary Science Program" stood at the head of the literature the concern was not just about Africa or Science or a Program. Many of the questions raised and points of view expressed were relevant and urgent everywhere. Science acted as the vehicle for discussion ranging across other subject areas. The Program emerged shyly -- a natural consequence, not a limiting framework. Jerrold Zacharias put the case squarely: we must learn how to work with children so that they can inherit the scientific world of tomorrow. To this there was no dissent. We are committed.

In the market of Kano men fashion primitive tools from discarded oil drums, beating the metal with purpose and skill. The metallic rhythm blends into the cacophony of sound of this ancient city behind its mud wall. But the great jets fly into the airstrip just down the road and the African sky is streaked by their trails. There is no time to be lost. For the inheritance to be grasped it will be necessary for the inheritors to profit from our present errors and 'leapfrog' over them.

The mistakes that have been made, both in the United States and Britain, largely stem from ignorance of the true purposes of education at the elementary school level and our premature concern that children should learn facts. The teacher has been seen as a person who transmits verbal structures -- a large 'jug' pouring information into smaller ones. Facts have been assembled into syllabi and the success of any teaching has been judged by the child's ability to reproduce information at will. As our view of the nature of young children becomes clearer it is apparent that the early years in school are very precious. The formation of attitudes and the realization of potential largely depends upon experiences at this critical stage. If the child learns only content, we have failed him. The elementary school is the place where children must learn how to learn.

But this is a subtle and complex business. The process is not yet defined in terms that are specific. At best, we have some guide lines woven into a fragile web.

Some things may seem so obvious that it is very surprising that they have been ignored. For example, any class of children, however defined, is simply a collection of individuals. If the group is introduced to any experience, each student will see it differently. Given a common task, individuals will tackle it with personal styles. Yet the teacher often presumes that experiences mean exactly the same thing to all and that there is only one 'right' way to deal with any situation. Such a viewpoint has led to the dreary and frustrating 'lockstep' pace of many schoolrooms. Worse than this, in such situations, children seldom come to value their own ideas. Originality is lost, perhaps for ever.

Learning how to learn involves the perception of problems and the development of strategies for solving them. Such a repertoire can only be learnt if children are presented with -- or allowed to find for themselves -- situations that are meaningful and complex, yet manageable. The situations must be meaningful in the sense that they have direct appeal to the child; they must be sufficiently complex for many related problems to be discerned by children who wish to explore in some depth. Yet these problems must be capable of solution without going too far outside the immediate experience; the whole should be manageable.

Children must have materials and equipment to manipulate and think about. They will work with things, not symbols. The symbols will come later, but the time scale will be different for each child. Problems are solved by actions and it may be impossible for the individual to describe any solution in words or to represent it diagrammatically. Premature pressures to these ends are harmful, although the ends are certainly valid at a later stage.

As children engage in such activity the first encounters are largely unguided. Each child follows his own course, first becoming familiar with the material and then seeing what will happen if this or that line is taken. The limits are defined by the materials, so it cannot be said that the activity is entirely 'free', although many surprising things occur. We sometimes call this 'play'. The term is charged with emotion and, to many, is only tolerable as a prelude to 'work'. To the child, play <u>is</u> work. It is his way of experiencing. So often we tend to hurry away from this vital stage, completely overlooking its value in our anxiety to guide children towards linear sequences leading to clear goals. Yet the re-combination of elements for no

single purpose is basic to creativity. It is exactly the style of scientific research.

As children play, they begin to develop learning strategies, trying them out in relation to problems that have meaning. It is not necessary to provide external motivation because the tasks are intrinsically interesting. The superimposition of instructions concerning the materials should not be hurried. The early stage of unguided exploration can, with profit, continue for longer than we think, although the teacher must be ever ready to give support or help if it is needed. If probelm solving strategies are explicitly formulated prematurely, nothing will be gained. The strategies will be hollow, useless facades. Children must come to generalizations in their own time. Many other lessons are learnt as children play, but one is of great importance. It is the validity of making mistakes. Recognition of this can only happen if children are not threatened by being proved 'wrong'. If they are permitted to follow up their own ideas to conclusions, even if the approach is not profitable in relation to the problem in hand, then children will come to think adventurously. In the relaxed play situation, when children are working with objects, mistakes can be made without the accompanying feeling of guilt or sense of failure.

To establish classroom situations where good things can happen is no easy task. So many factors work against it. The orientation of students in rigid, formal lines suggests that learning is a one-way traffic. Text books give an authority to symbols which is seldom deserved. Teacher training perpetuates the pedagogue. Systems of inspection can stifle initiative and impose common standards which are often mediocre. In all, the circle seems tightly closed, with no way in.

The Conference at Kano was directed towards the teaching of Elementary Science. Not the spurious muddle which masquerades as the real thing, but genuine Science, to be taught in an intellectually honest way, with the child firmly in mind. As we considered what had been done in this field it became clear that the approach to genuine Science was exactly the approach to education in general. Indeed, work with children, such as that of the Nuffield Foundation Junior Science Teaching Project in the U.K., although having its beginnings in Science, had permeated the whole curriculum, giving it unity and meaning. The development of Units of work in Science, such as

those of the Elementary Science Study, suggest how attention can be focussed on promising microcosms within which the child can explore and meet success.

Work in Science presumes a willingness to predict. This will not develop unless the child is free to play. Predictions can only be made if experiences can be organized to these ends. The search for 'truth' is by a progression of parameters, with a feel for elegance. But truth is unobtainable and we must rest content with close approximations. There is no absolute answer to any question, but , in seeking the best we can, we isolate goals and use strategies that sometimes pay off. The combinations and re-combinations of elements of experience that children make in work of this kind are basic to their intellectual development. We may call it Science, but it is so much more.

Elementary Science must be concerned with reality. It is an environmental experience. Children will work with things and 'stuffs'. They must be active, experimenting and thinking for much of the time. In such situations the teacher will have a different role. His function is first to arrange the experience and then lead the children along. Provision of the experiences is the least difficult aspect. We know some that are promising and others, appropriate to local conditions, can be devised. Co-operative efforts by scientists and educators have already begun and the teacher can have massive support. But the arrangement of any experience to suit the varying needs of children requires the right question to be asked here, the subtle nudge there. In this, the teacher is on his own, and the way of working may be totally unknown. Clearly, the style can be learnt, but it may take time, and teachers who are trying to adapt to the new way will need help and encouragement.

And so the Kano Conference settled down to plan for tomorrow. Clearly, the problems were immense; the real goals long-term. But we had seen the bright eyes of the children and the deep interest of the teachers. We were agreed that Science should be the touchstone to help children look at their world in new ways. The real problem is to make certain that Science is introduced for the best reasons and in the right way.

Experience in the United States suggests that reform follows an exponential cycle of expansion, but that the beginnings should be modest. A partnership of people of good intent from all levels in the educational hierarchy is essential. The production of materials is time-consuming and

requires expert knowledge in depth. Communication about the materials to the teachers is difficult to effect.

We convened in groups to plan what might be done. The schemes and suggestions differed, but each had the same spirit and the same intent.

It now remains to marshall resources, to work together and share the responsibility. It will not be an easy path to success, and the journey may be long.

APPENDIX III

REGIONAL REPORTS

The reports which follow are summaries of statements made by the spokesmen for the regions.

Bechuanaland, Basutoland, Malawi, Rhodesia, Swaziland

1. Initially in the countries of this region there is a need for small groups to work on curricular development in a University atmosphere. At the beginning, ministerial involvement may not be great.
2. Teachers should work in the centers for at least 6 weeks to ensure proper understanding of the attitudes and philosophy being encouraged by the centers.
3. People working in small countries need to be kept well informed of activities in other places.
4. There is a need for full information, and kits and materials to support the information.
5. There is a need for a central agency to distribute information and materials. Could A.I.D., Nuffield or E.S.I. undertake this task?

Liberia, Sierra Leone

1. Each country should have a center and these should operate closely with the ministry.
2. The center should include a workshop, an exhibition room, a library, etc.
3. Njala University has three science educators prepared to involve themselves in this activity.
4. There should be close liaison between the Sierra Leone and Liberia centers.

Ghana

1. There should be a meeting in Ghana of representatives from the ministries, headmasters and principals of Teacher Training Colleges, to make possible

the experimental use of E.S.S. material in trial schools. A successful experiment would convince the ministry of the need for materials in other centers.

2. E.S.I. should (a) loan experts to centers;
   (b) ensure collaboration and liaison with other centers;
   (c) make possible exchange visits;
   (d) replace teachers/professors to permit service in centers;
   (e) make possible the exchange of personnel.

East Africa

1. Initially the Nairobi center should be developed to undertake the new tasks in Elementary Science
2. Uganda and Tanzania should develop their centers later.
3. A workshop should be held during the long vacations to interest University people in the new ideas.
4. Teacher Training Tutors should be exposed to the new ideas.
5. E.S.I. should make possible the replacement of secondary school teachers who could be useful in the centers and workshops. This point was emphasized by Mr. Gitau who added that some Kenyans could be sent to the States to observe curriculum reform movements.
6. There is a need for reading matter - small, cheap, legible pamphlets of illustrated reading matter in both English and Swahili in enormous numbers (Megabooks).

Nigeria

1. Nsukka could be a co-ordinating center for a network of science centers operating in each region, or university.
2. The work of the co-ordinating center would be controlled by a steering committee whose members would be representatives of the Ministries and Universities in the various regions.

3. The co-ordinating center would guide and advise the science centers in their work.

4. A co-ordinating center would require:

   (a) Director Scientist

   (b) Technician - innovator

   (c) Teacher researcher

   (d) Full-time administrator, secretary, clerk.

5. The Director-Scientist should be a Nigerian (who would be replaced by E.S.I.) and should hold office for at least one year.

6. The Co-ordinating Center would:

   (a) try out E.S.S. units in teacher training colleges;

   (b) undertake in-service training of teachers;

   (c) involve teacher training colleges;

   (d) undertake teacher education.

APPENDIX IV

THE CENTERS

It seemed clear from the regional reports and the general discussion in the conference that the science centers in the African countries would require varying kinds of assistance, and a flexible system should be developed which would permit the giving of the required help.

The types of help suggested were:

(a) If the local country supplies the Science Innovator to work in the center, E.S.I. should be able to provide a replacement who would undertake part of the local person's original duties while also developing science materials in the center.

(b) E.S.I. should supply the Science Innovator to work in co-operation with local personnel.

(c) E.S.I. should make possible the replacement of local personnel who will be required to work in the centers. This may require co-operation with the Peace Corps or local US A.I.D. who could make available secondary teachers or teacher training tutors.

(d) E.S.I. should give financial assistance for the reproduction of materials for experimental use.

(d) E.S.I. should give financial assistance for the training of teachers to use the experimental materials.

It was agreed that there should be a real local involvement in the work of the centers. While this involvement would vary according to the resources, materials and manpower of the countries, most countries would be able to provide -- possibly with replacement assistance -- the following:

(a) A secondary school teacher or teacher training tutor with good qualifications in science who could work with the science innovator and could be trained in the work of curriculum development.

(b) A primary teacher who would initially try out the experimental units, assist in their production and the preparation of the materials necessary for the initial experiment. This teacher could have a half timetable in a local school.

(c) Housing and accommodation for the staff of the center.

(d) Administrative backing, paper, typing, etc. either through the department of the University of the Ministry of Education.

(e) Co-operation in and part responsibility for the training of teachers for the experimental use of the materials.

(f) Provision of a workroom with water, electricity, tables, chairs, and with normal maintenance and cleaning facilities.

APPENDIX V

MEGABOOKS

In some of the earlier discussions of the conference, speakers mentioned the great shortage of suitable reading materials for African schools. There was a real need for good, cheap, well-produced books which African children could take home from school and which, because they were cheap, could be made readily available.

Arising out of these discussions, it was decided to investigate with Franklin Publications and other organizations in Africa or the U.S.A., the possibility of having books published in Africa in very large numbers for use in all the English-speaking countries. These books, because of their wide distribution, could be sold very cheaply. The name "Megabooks" was given to this project.