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ABSTRACT

The proceedings of a seminar, held in Uganda at the conclusion of the operational phase of the UNESCO Pilot Project for Biology Teaching in Africa, are summarized under the following agenda headings: (1) Relations between teacher and research scientist in Africa, Place and role of biology in the curriculum, (2) Problems of biology teachers in Africa, (3) Use of teaching materials produced during the Pilot Project, (4) Effect of UNESCO Pilot Project upon country activities, (5) How to avoid dogmatic teaching, (6) Place of books and of audio-visual methods, (7) Use of living material and the importance of field work, (8) Methods of evaluating curricula and new teaching techniques, and (9) Future activities in collaboration between the African countries for the improvement of biology teaching. Recommendations concerning each of the agenda items are collected at the end of the report. A chart summarizing the biology programs of the African countries, including the types of subject matter taught by age and school level, is appended. A list of participants is also included. (AL)

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UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

PILOT PROJECT ON NEW APPROACHES AND TECHNIQUES IN BIOLOGY TEACHING IN AFRICA

CLOSING SEMINAR HELD AT KAMPALA (UGANDA)

from 5 to 11 January 1972

FINAL REPORT

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Annex 1. Agenda

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1. INTRODUCTION

The Unesco Pilot Project for Biology Teaching in Africa was launched by the Division of Science Teaching to assist the Member States of the continent in their efforts to adapt their biology teaching in secondary schools to African conditions and needs. For that purpose, national study groups were set up in several countries participating in the Project, and international working seminars were organized to assist African teachers in producing, by their own efforts, new teaching material suitable to meet African needs. At the international level, those activities were carried out during the 1967-1968 biennium in the English-speaking countries, and in the 1969-1970 biennium in the French-speaking countries of Africa. An English-speaking international seminar spent ten months in Cape Coast, Ghana, working on an experimental textbook for the first cycle of secondary education, based on the ecological approach to general biology. Four two-month international seminars were subsequently held in French-speaking Africa - in Abidjan (Ivory Coast), Tananarive (Madagascar), Rabat (Morocco) and Yaoundé (Cameroon). The outcome of those seminars was the production of teaching materials for upper secondary school-teachers which were designed to fill the gaps existing in the teaching of tropical ecology, the conservation of biological resources, plant physiology and human biology.

The Closing Seminar was held one year after the end of the operational phase of the Pilot Project. On that occasion, the countries concerned were asked to consider the question of how the material produced and the experience gained by the African participants in the Project should be used at the national level.

Some thirty former participants in the Pilot Project were invited to attend the Closing Seminar and 21 of them were able to do so. They had worked on the Project in the following African countries: Botswana, Cameroon, ARE, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mali, Morocco, Mauritius, Senegal, Tanzania, Uganda, Zaire and Zambia. Among them there were twelve African teachers and five expatriate teachers with long experience of biology teaching in Africa. All the participants attended the Seminar in a personal capacity and not as official representatives of their countries. Four former Project consultants from outside Africa, of whom one came from Australia, two from France and one from the United Kingdom, took part in the Closing Seminar. Two members of the Unesco staff, one from the Division of Science Teaching at Headquarters and one from the Field Science Office at Nairobi, completed the list of participants (see Annex 2). Several teachers of natural sciences in Uganda attended the Seminar as observers.

Thanks to the generous invitation of the Government of the Second Republic of Uganda, the Seminar was held at the Congress Hall in Kampala. The inaugural address was delivered on Wednesday, 5 January, by Mr. Edouard Rugumayo, Minister of Education of Uganda. The closing session, which took place on Tuesday, 11 January 1972, was presided by Professor Banage, Minister of Animal Industry, Fisheries and Game. The Uganda National Commission for Unesco spared no pains to supply all the facilities required to ensure the success of the meeting.

Mr. E. Mohapi (Lesotho) was elected Chairman of the Seminar and Mr. S. L. Gueye (Senegal) and Mr. D. Kasirye (Uganda) were elected Vice-Chairmen. The office of Rapporteur-General of the Seminar was entrusted to Mr. A. Sasson (Morocco). The Seminar adopted the agenda attached to the present report (Annex 1).

2. RELATIONS BETWEEN TEACHER AND RESEARCH SCIENTIST IN AFRICA

After a wide-ranging discussion of the above subject under item 1 of the agenda, it was agreed that it would be desirable to maintain and strengthen relations between teachers and research scientists, whether the latter worked in the university or in other scientific and technical sectors of the country. Such a dialogue should enable teachers, who are responsible for the education of a large potential labour force, to widen their horizons and take an interest in questions of economic development, labour, employment and the training of every category of skilled or professional workers.

The Seminar emphasized that such relations between teachers and research scientists would be beneficial to both parties. They might indeed be expected to lead to the constant improvement and adaptation of curricula and teaching methods through the introduction, into the latter in an appropriate way, of the results of basic and applied research, to a better understanding of the needs of secondary education, its methods and motivations (thereby bringing about an improvement in

teacher training at university level), to the quickening of pupils' interest in economic and social problems, and to a more satisfactory system of guiding pupils towards areas of priority importance.

The Seminar appeared to be well aware of the difficulties which beset such relations, sometimes even preventing the first step from being taken towards their establishment, but it noted at the same time that such relations had developed in a very promising manner in several African countries. That trend deserved to be encouraged in every possible way since, in spite of the often very limited means available, it should contribute to a fuller appreciation of the proper place of biology teaching in the process of economic and social development.

The Seminar also considered further ways of ensuring inter-communication between the three following sectors: teaching, scientific research, and its applications.

3. PLACE AND ROLE OF BIOLOGY IN THE CURRICULUM

Under item 2 of its agenda, in addition to discussing general considerations, the Seminar dealt with problems relating to the environment and its rational use, as well as with the relationship between biology teaching and integrated science teaching.

The Seminar decided to set up a working group composed of Mr. H. Camefort, Mr. S. L. Gueye, Mr. J. Kimura, Mr. D. Morgan and Mr. T. Traoré to draw up proposals, on the basis of existing educational systems in the French-speaking and English-speaking African countries, regarding the place of biology teaching in different classes (namely for different age groups), its importance as compared with the other scientific subjects, and the themes considered to be the most appropriate in the light of the special conditions and needs of Africa.

The participants drew special attention to the following points in plenary session:

(a) Biology must be included in the curricula of all secondary school classes. Biology teaching at this level must be a logical and natural follow-up to that provided in primary or elementary education which dealt mainly with natural phenomena.

(b) In considering the place of biology among the other sciences (mathematics, natural and human sciences), it was important to bear in mind not only its social and economic rôle but also its contribution to the training of the mind. Biology programmes and teaching methods should accordingly take this into account. In particular, these programmes and methods must be geared to the socio-cultural background of African pupils and their needs at different ages, and this would make it essential to co-ordinate biology programmes with those of the arts and human sciences.

(c) Biology courses in secondary education must give prominence to matters relating to the conservation of natural resources, the rational use of man's environment, and the struggle against the various forms of pollution resulting from the effects of technical progress. Care must be taken, however, to avoid any tendency to create a new branch or discipline. On the contrary, the introduction of these themes should be seen as another way of approaching biology teaching which had the advantage of touching on several aspects of the science while offering solutions to concrete and vital problems. It was also necessary to associate respect for man's environment and its rational use with his legitimate aspiration for better living conditions, since it was precisely the rôle of biology to bring out the importance of ecological facts and laws.

(d) There was a need for greater cohesion of the various disciplines making up biological science if its teaching was to become more effective and more concerned with arousing interest in development schemes. It was also essential to discover points of contact and association with the other sciences, in the interests not only of strengthening the teaching of biology as such but also of rounding off the pupils' general scientific training. The majority of participants in the Seminar felt that, generally speaking, it was too early to introduce integrated science teaching in Africa immediately. This might be envisaged later, however, once biology programmes and teaching methods had been improved and adapted and when relations with the other sciences had been better defined and understood. It was thought that the biology teacher could then assume responsibility for all science teaching (apart from

mathematics) in the first two years of secondary schooling, and this would clearly lead to an economy of teaching staff. With this in mind, teacher-training methods should be adapted to prepare biology teachers for integrated science teaching.

Annex 3 contains a comparative study of biology programmes at different levels of schooling in Africa.

4. PROBLEMS OF BIOLOGY TEACHERS IN AFRICA

Under item 3 of the agenda, the Seminar discussed the following problems: the rôle of teachers in the process of improving curricula and methods; further training and refresher courses for school-teachers; scientific information and life-long education for university teachers.

The Seminar strongly recommended that an appeal be made to national teachers to set up and strengthen study groups or commissions for the improvement of teaching methods, in spite of the difficulties arising from the limited number of national teachers and their initial inhibitions which were due to psychological factors.

Those working groups could be assisted, if necessary, by national or international university counsellors and by curriculum development specialists, but the principal effort must be made by the teachers themselves, who, as the practitioners of education, were naturally aware of the need to improve it.

To meet the aims of the educational renewal movement which must be the constant concern of all teachers, it was essential to provide further training for the latter. The Seminar advocated the establishment of refresher courses, comprising scientific and pedagogical updating and also the drafting of new programmes, textbooks and teacher's guides, and allowing for reflection on examination methods. It should be possible for all teachers to receive further training in due course, which implied that such training should be recognized as a professional obligation, to be taken into account in a teacher's service record as a normal part of his career, on the understanding that the teacher should attend the courses without interrupting his teaching work. The best place for running the courses and introducing the ensuing improvements in the curriculum was the school itself, but the university, and national and regional pedagogical institutes could also be called upon to help.

It gave great satisfaction to the Seminar to learn that efforts had been made by several African countries to provide for the continuing further training of secondary school-teachers, and that they had shown commendable concern to use local resources and means for that purpose. In addition, it was suggested that use should be made of the mass media, that regional courses and seminars should be organized for the discussion of results of experiments in educational reform, and that consideration should be given, where necessary and if the means were available, to the possibility of setting up institutes whose principal task would consist in curriculum development and the further training of teachers. Emphasis was laid on the rôle of teachers' associations and the need for them to take an active part in pedagogical reform and life-long education.

To sum up, the Seminar noted that groups of national teachers were working throughout Africa on a thorough reform of curricula and teaching methods at the national level and often in co-operation with those responsible for similar activities at the regional and international levels. The ultimate aim of those groups was to enlist the active participation of all the teachers in their respective countries, an aim which had every chance of being attained once the further training of teachers was recognized as being an integral part of the obligations resting on their profession.

5. USE OF TEACHING MATERIALS PRODUCED DURING THE PILOT PROJECT

Apart from the materials produced by the English-speaking countries taking part in the Pilot Project, which had been distributed in English and in a French translation in all the countries concerned (booklets for junior secondary school pupils and two teacher's guides), the Seminar noted a progress report on the publication and distribution of the materials prepared by the French-speaking countries participating in the Project.

Those materials consisted of 12 to 15 booklets, of about 60 pages each. Six booklets were ready for distribution, having been published thanks to the joint effort of Unesco and AUDECAM (Association universitaire pour le développement de l'enseignement et de la culture en Afrique et à Madagascar). Five hundred copies of each booklet had been printed.

Three booklets had been prepared on each of the following themes: African ecology; plants and the soil; some aspects of human biology; the protection and conservation of biological resources in Africa and Madagascar.

Twenty colour slides accompanied each booklet. Ten 4-minute film loops and two 10-minute films had also been produced.

The materials in question, which were not intended for pupils' use, consisted of sets of teaching notes, each dealing with one specific theme and comprising the following parts:

a summary of the subject matter (general plan and basic concepts);

teaching hints (adaptation of the theme to a given standard or class, pedagogical techniques);

a simple bibliography, covering the topics dealt with.

Several notes on practical work, describing procedures for experiments and the results to be obtained and discussed, had also been included and represented the work carried out during the international seminars.

The Seminar noted with satisfaction that the large quantity of material collectively produced by the French-speaking participants in the Project was being translated into English. The English edition of the booklets would probably be published with the assistance of CEDO (Centre for Education and Development Overseas) in London, which would also help to distribute it in the English-speaking countries concerned.

All the members of the Seminar considered that it would be very inadequate to distribute only a few dozen copies of each booklet in each country. They wished arrangements be made to supply every secondary school teacher with a copy of every document produced.

The Seminar took note of the fact that Unesco would be unable to provide the funds required to increase the number of copies to be distributed. It therefore strongly recommended either that the governments concerned should purchase the extra copies they required or that the materials should be reproduced locally (AUDECAM was prepared to bring out a supplementary edition or even to reprint the documents if this was necessary to meet orders from the African countries).

The Seminar laid stress on the need to back up the distribution of the materials described above with a teachers' briefing campaign and a classroom evaluation programme. This seemed to be a very appropriate task for the national study groups or national educational renewal commissions to undertake.

The Seminar felt strongly that the materials should be transmitted by Unesco to the national study groups. It was essential that those groups should be officially recognized and integrated into national educational bodies, for in that position they would play a more active part in the distribution and effective utilization of the Pilot Project materials.

6. EFFECT OF UNESCO PILOT PROJECT UPON COUNTRY ACTIVITIES

Under item 5 of its agenda, the Seminar considered the effect of the Unesco Pilot Project upon country curricula, the production of local editions of teaching materials and the development of the new projects.

Although several African countries had started the work of educational renewal before the Unesco Pilot Project was launched, the Seminar was unanimously of the opinion that the Project had been completely successful in so far as it had contributed to the creation, encouragement or extension of such educational renewal schemes.

The materials produced during the Pilot Project had been used in several ways:

partial or total utilization (ARE, Madagascar, Malawi, North Africa);

as a source of documentation for national curriculum development work (ARE, Madagascar, Morocco, Mauritius);

as a source of information influencing new national programmes (Kenya, Uganda, Tanzania, Ethiopia);

as a cultural instrument for teachers (Zambia).

The Seminar noted with satisfaction that all countries had embarked upon a significant reform of their curricula, that the new measures taken were already being applied and that the assistance offered by the Pilot Project had been welcomed in all cases and had served to strengthen national action.

The Seminar further noted that energetic efforts were being made to prepare textbooks and teacher's guides with a view to following up the initial effort to modify and improve curricula. It was clear, therefore, that the national study groups set up for the purposes of the Unesco Pilot Project should continue, whether in their present form or in the new form of national educational commissions or as an integral part of higher educational bodies, to carry out the vitally important task of drafting textbooks and teacher's guides, in the light of national priorities, the most important themes and the means available, and drawing on Pilot Project documentation according to their needs and national policies.

The preparation of illustrative material and sets of equipment, the promotion of educational documentation centres, the publication of information bulletins for teachers, and the creation of professional associations were other tasks requiring the constant attention of national study groups or national commissions for educational renewal.

The Seminar was informed of the translation into Arabic of material partly produced during the Pilot Project, after modification and adaptation to national requirements (Iraq).

The Seminar was impressed by the considerable effort being made by the countries concerned. In spite of the inevitable uneveness of achievement, their activities in this field demonstrated their will to extend the essential work of educational renewal to the teaching of biology.

7. HOW TO AVOID DOGMATIC TEACHING

The Seminar noted that the following factors helped to create a climate favourable to dogmatic teaching, a form of teaching in which knowledge imparted by the adult was received passively by the pupil:

1. a type of teacher training which did not always lay sufficient emphasis on the active methods recommended to avoid a dogmatic approach to the task of enabling the pupil to acquire the adult's knowledge;

2. inadequacy of illustrative and experimental materials, and uneven distribution of such materials in the schools;

3. lack of basic training of primary school pupils in active and discovery methods.

The Seminar recognized that active methods were time-consuming, so that time-table difficulties might arise, depending on the number of hours available for biology teaching. It believed as a whole, however, that non-dogmatic teaching should be considered as a long-term objective calling for threefold preparation:

preparation of teachers;

technical preparation (classroom equipment, documentation);

preparation of pupils (active methods must be used at the primary level with a view to creating in the pupil a mental attitude averse to dogmatic methods).

For lower secondary education, in which biology had an essentially formative part to play, the use of active methods appeared to be vitally important, and the Seminar unanimously recommended that a special effort be made to employ those methods in biology teaching at that level.

For upper secondary education, particularly in the terminal classes, some degree of dogmatism was bound to enter into the teaching of certain modern or contemporary aspects of biology (molecular and cellular biology, biochemical genetics, ecology). Although experimental work was difficult, or even impossible, in the teaching of such subjects, their inclusion in the curricula was justified by the desire to illustrate another approach to biology, the importance of introducing the pupils and the teacher to those fields and the need to bring the teaching of biology closer to that of physics and chemistry at that stage.

The Seminar agreed that the social circumstances of the African countries made it necessary to be selective as regards the topics to be studied and therefore to give preference, particularly at the lower secondary level, to concepts which helped the individual to adapt better to his natural and social environment.

The Seminar also recognized the value of questions which were hard to present and illustrate, and noted with approval the various measures other than experimental which were being employed to avoid or attenuate dogmatic teaching:

presentation of experimental procedures, notably through the use of audio-visual media (slides, photographs, films, etc.);

numerical presentation of the results of experiments (graphs, charts) and their discussion in the classroom;

presentation and analysis in the classroom of the original accounts of certain discoveries;

new presentation of old experiments;

organization of visits to higher educational and technical educational establishments, to factories, farms, etc., and at the same time of discussions with the specialists;

invitations to specialists to visit schools in order to hold joint discussions with the pupils and staff on the results of scientific and technological research.

A teacher using the active method should see the classroom as part of a whole, comprising: a laboratory and a garden for experiments, audio-visual media, a library and printing equipment, all of which should be an encouragement to free discussion between the pupils and their teacher and should arouse interest in the environment. One or all of these facilities could be used to illustrate any theme in the curriculum effectively by active methods.

The Seminar strongly recommended that one or more documentation centres be set up at national level, as well as an international centre, to supply data and materials and summarize the results of national experiments in active teaching methods.

8. PLACE OF BOOKS AND OF AUDIO-VISUAL METHODS

The Seminar welcomed the fact that textbooks and teachers' guides intended gradually to replace out-of-date and unsuitable material were being prepared for all secondary school classes in every country concerned. That common effort was expected to have the effect of limiting the use of books published outside Africa, which were of little help to teachers in the countries concerned.

The Seminar believed that the following objectives still had to be attained:

(a) the combined use of all teaching materials (books and audio-visual media) with emphasis on the need to ensure their complementarity;

(b) the production, with the means available on the spot, of appropriate, well-illustrated and well-documented textbooks, easy to use and suitable for active teaching methods; the drafting of teachers' guides and notes, easy to consult and handle in the preparation of lessons and practical work. Several countries (Cameroon, Ethiopia, Malawi, Morocco, Mauritius, Kenya, Uganda, Tanzania) had already made good progress with that operation, which involved releasing several teachers from their normal duties;

(c) widespread use of audio-visual media for the presentation, explanation and illustration of scientific information (for example, the films and slides produced during the Pilot Project);

(d) the local production, with technical assistance, of illustrative material for national and regional use;

(e) the continuation and intensification of efforts to supply secondary schools with the equipment they required to carry out experiments as frequently as possible and illustrate biology lessons properly.

9. USE OF LIVING MATERIAL AND IMPORTANCE OF FIELD WORK

The Seminar drew attention to the difficulties which stood in the way of widespread and frequent use of living material and to the paucity of field work. The difficulties concerned were mainly of a practical nature (isolation of educational establishments, lack of means), but might also stem from inadequate teacher training.

The Seminar recommended that teachers and pupils together should make every possible effort to procure living animals, freshly gathered plants, strains of microbes, etc., with a view to coming to grips with the natural environment at the least cost.

Apart from the efforts made to improve the position at the teaching level, the Seminar believed that the national documentation centres might assume responsibility for supplying living material.

10. METHODS OF EVALUATING CURRICULA AND NEW TEACHING TECHNIQUES

The Seminar found that it was essential to undertake a careful and progressive evaluation in the classroom of the effectiveness of the development of biology teaching, the preparation of new curricula and the production of textbooks and teachers' guides. The choice of pilot schools and of the materials to be tested raised certain problems, and others would arise at the time of reaching the final conclusion. The Seminar therefore considered that the evaluation exercise should remain the responsibility of the competent national authorities, although objective methods, which were easy to work out, were already being used in several countries; they involved:

the organization of a flow of information between a number of pilot schools and the authorities responsible for the teaching under evaluation;

the organization of teachers' meetings for the pooling of results and comments;

the organization of larger symposia to discuss the results of the evaluation exercise, analyse answers to questionnaires and arrive at a final conclusion.

11. FUTURE ACTIVITIES

Under item 10 of its agenda, the Seminar discussed future activities concerning arrangements for collaboration between the African countries for the improvement of biology teaching, as well as various possible means of assisting the national study groups.

The Seminar unanimously reaffirmed its conviction that the Pilot Project must be completely implemented, and particularly that the documents and materials produced must be fully distributed. In that connexion, the Unesco representative informed participants of the following points:

additional copies of the English-language documents produced at Cape Coast would be distributed very shortly;

additional copies of the Cape Coast documents translated into French were held at the disposal of the countries interested at the Unesco Regional Office at Nairobi;

only one hundred copies of the documents drafted in French during the international seminars held in the French-speaking countries would be distributed, but AUDECAM could meet orders and might perhaps distribute a limited number of copies to the OCAM countries free of charge;

the English translation of the documents produced during the French-speaking seminars was not yet printed. Unesco would provide a subvention for this purpose, probably in co-operation with CEDO, and could meet a limited number of orders from the English-speaking countries. It had already arranged for 200 copies to be made of the slides which would accompany the English edition;

the films produced at Cape Coast would be distributed very shortly in the Super 8 format and all the films produced during the international seminars held in the French-speaking countries would be distributed in the 8mm. and Super 8 mm. formats.

The Seminar laid stress on the need to strengthen the national study groups, preferably integrated into national educational bodies, so that they could pursue their tasks of renewing and improving biology teaching. It also recommended that new national documentation centres be set up and existing centres strengthened, that efforts be made to collaborate with other national ministries or with other multilateral technical assistance bodies (WHO, FAO, Unicef), and that associations of biology or natural science teachers and scientific societies be formed or expanded.

All those measures should lead to the development of simple and effective communication machinery designed to supply the teacher with all the assistance he required to improve the quality of his teaching.

The Seminar noted with satisfaction that the budget of the Unesco Division of Science Teaching included the credits proposed for the 1973-1974 biennium which might assist the national study groups or educational commissions in their activities.

As regards regional activities, the Seminar took note of several suggestions concerning the following arrangements for co-operation and co-ordination:

(a) The immediate establishment and utilization for a period of at least five years of a system for the exchange of all the relevant information obtained from the countries concerned through the Unesco regional centres at Nairobi and Dacca. Each of those two centres should be strengthened by the appointment of two specialists, one in education and one in science teaching, in order to be better equipped to compile and disseminate the information received.

(b) Direct exchanges of information between national study groups of the same bio-geographical region, this being understood to be a region in which there was sufficient common ground for such exchanges of information on teaching experiments to be profitable. The information to be exchanged should deal with curricula, textbooks, and the methods used. In addition, working groups or seminars in each bio-geographical region would consolidate the material collected. Unesco fellowships should meet the expenses of teachers travelling between different countries within a given region.

(c) Invitations to African universities contribute to the improvement and adaptation of biology curricula in the regions defined above and in certain specialized fields.

(d) The establishment of close links between the Unesco centres at Cairo, Dakar and Nairobi and other international bodies interested in biology teaching (International Union for the Conservation of Nature and Natural Resources, IUCN; Organization of African Unity, OAU).

The ultimate aims of regional co-operation were: the integration of curricula, the compilation of scientific and educational information, the creation of equipment "banks", the final edition of textbooks (which could then reach a very large regional market) and the further training of teachers.

The Unesco representative informed the Seminar of the following measures which would be likely to further regional co-operation:

(a) a project request had been submitted to UNDP for a travelling biology expert to be sent to Africa for two years;

(b) regional bulletins on science teaching were to be published by the Unesco centres in 1973-1974;

(c) two meetings were to be held in 1974, one being an international meeting on the new projects concerned with the improvement of biology teaching, and the other a regional meeting in Africa on the teaching of science and technology.

The Seminar emphasized that, although the Pilot Project had been conducted in Africa, it was essential to make the results known at the international level, not only to the other developing countries but also to the technologically advanced countries. It considered that the Unesco Division of Science Teaching was the most appropriate body to carry out that task. In particular, the Division should forward the results of the Pilot Project to the United Nations Conference on the Human Environment (Stockholm, June 1972).

Several participants also requested that Unesco participate in the translation into English and French of the documents produced; their distribution in the countries concerned would assist in improving the quality of biology teaching.

The Seminar noted that Unesco would be unable to follow up the Pilot Project by providing continuing assistance to the countries concerned; it could only undertake the activities mentioned above, which should prove helpful at both the national and the regional levels.

12. RECOMMENDATIONS

Recommendations on the Pilot Project

The Seminar, noting the significant reform of biology curricula and teaching methods which had been undertaken in many of the countries concerned, the application of the new measures taken and the excellent response to the Unesco Pilot Project, unanimously recognized the great success of the Project in so far as it had contributed to the creation, encouragement and strengthening of national educational renewal schemes.

The Seminar wishes to express its thanks to Unesco for the considerable financial effort it has made, and its belief that it would be highly regrettable if the countries concerned failed to reap the full benefits of the Project.

(i) The Seminar recommends the widest possible distribution of all the Project documents already produced or in course of publication, drawing attention to the need for the countries concerned to acquire all the copies they required or to arrange for the local reproduction of these documents so that they may be made available to all teachers.

(ii) The Seminar recommends that the distribution of the documents through the national study groups or equivalent bodies should be backed up with a teachers' briefing campaign and a classroom evaluation programme.

(iii) The Seminar recommends that the national study groups be integrated as permanent educational commissions into a higher educational body, that they continue to carry out the vitally important task of drafting textbooks and teachers' guides, in the light of priorities and the means available and drawing on the Pilot Project documentation according to their needs and national policies, that they participate in the preparation of illustrative material and sets of equipment, the promotion of educational documentation centres and the publication of information bulletins for teachers.

Recommendations on the place and rôle of biology in the curriculum

The Seminar studied several general problems relating to the place and rôle of biology in the curriculum, teaching methods and the means required. The following recommendations are mainly of interest to the countries of Africa which was the area chosen for the implementation of the Pilot Project.

(iv) The Seminar strongly recommends that biology be included in the curricula at all levels of primary and secondary education, that its place among the other sciences be considered in the light not only of its social and economic rôle but also of its contribution to the training of the mind, this being of particular importance in lower secondary schools, and that special attention be given in biology courses to matters relating to the conservation of natural resources, the rational use of man's environment, the struggle against pollution, demography, health, nutrition and agriculture, without thereby throwing the courses out of balance or starting to create an additional discipline.

(v) The Seminar, while recognizing that it sometimes seems too early, especially in Africa, to introduce integrated science teaching immediately, recommends that efforts be made to discover points of contact between biology and the other sciences, and that biology teachers be then gradually entrusted with the responsibility for integrated science teaching in the first two years of secondary schooling.

Recommendations on biology curricula, teaching methods and means

(vi) The Seminar, noting that teachers are working actively on the reform of biology curricula and teaching methods at the national level and often in co-operation with those responsible for similar activities at the regional and international levels, strongly recommends that these groups be strengthened and supplied with all the assistance they require by their national authorities and by Unesco.

(vii) The Seminar recommends that inter-communication be ensured between secondary school teachers and specialists in scientific research and its applications, by the following means: teacher-training methods taking into account the scientific and educational needs of the profession; synoptic publications analysing the most important areas of scientific knowledge and providing information on teaching innovations; workshops and further training courses or seminars for teachers, run by university lecturers and by teachers or educators who are specialists in the adaptation of scientific and pedagogical knowledge.

(viii) The Seminar considers that the aims of the educational renewal movement can only be attained if refresher courses for teachers are organized, and if the scientific and pedagogical updating work they involve is taken into account in a teacher's service record as a normal part of his career, so that all teachers receive further training in one course.

(ix) The Seminar re-emphasizes the need to make use of active methods in all biology teaching, particularly in lower secondary education and the shorter secondary courses, and to avoid a dogmatic approach even in teaching certain modern aspects of biology. The elimination of dogmatic methods in biology teaching remains an objective to be attained by the following means: appropriate teacher training, in other words, teacher training which is itself free from dogmatic methods; a marked improvement in the illustrative and experimental materials used in the schools; the psycho-pedagogic preparation of pupils who should be accustomed to active methods at the primary level.

(x) The Seminar strongly recommends the continuation and intensification of national policies for supplying secondary schools with adequate equipment to enable them to carry out experiments and illustrate biology lessons properly. To attain this objective without incurring unnecessary expenditure, national documentation and supply centres run by the permanent educational commissions should be set up. In particular, these centres should assume responsibility for the distribution of living material and other teaching materials to educational establishments and encourage the raising of animals and plants by schools.

(xi) The Seminar recommends that the production of textbooks and teachers' guides be continued in accordance with national priorities and as required by specific programmes, for it is a vitally important aspect of the work of educational renewal. This task should be undertaken mainly by practising teachers, assisted by university counsellors and Unesco educators and specialists, in

such a way as to take account of the progress made at regional and international levels. The objective evaluation of the new teaching techniques is a logical follow-up to educational reform, and the Seminar notes with satisfaction that it is already being undertaken in some countries.

Recommendation on future activities

(xii) The Seminar reaffirms its conviction that the Unesco Pilot Project must be completely implemented, and particularly that all the documents and materials produced must be fully distributed to all the countries concerned. It notes with satisfaction that such is in fact Unesco's intention.

The Seminar earnestly hopes that, should extra funds be needed to complete this task, Unesco will not hesitate to supply them, so as to reap the full benefit of the heavy investments already made.

(xiii) The Seminar recommends that, at the same time as the study groups are being strengthened and integrated into national educational commissions or other national educational bodies, the countries concerned endeavour to set up documentation centres, form associations of biology or natural science teachers and scientific associations, and co-ordinate programmes for the improvement of biology teaching with multilateral technical assistance projects (FAO, WHO, Unicef), with a view to achieving maximum efficiency in the rapid supply of information to secondary school-teachers.

(xiv) The Seminar hopes that Unesco will show continuing interest in the activities originating in the Pilot Project, and strongly recommends that the following arrangements be made for co-operation between the countries concerned with the assistance of Unesco:

(a) The exchange of all the scientific and educational information obtained from the countries concerned through the Unesco regional centres at Dakar, Cairo and Nairobi. The Seminar strongly recommends the strengthening of these centres in such a way as to equip them to shoulder the task of translating, disseminating and co-ordinating the information received.

(b) Direct exchanges between countries belonging to the same bio-geographical region of information on curricula and teaching methods and innovations, which would be achieved by the organization of seminars for the consolidation of such material and of refresher courses, in close co-operation with the Unesco centres at Dakar, Cairo and Nairobi and with the other bodies interested in biology teaching (International Union for the Conservation of Nature and Natural Resources, IUCN; Organization of African Unity, OAU; United Nations Economic Commission for Africa, UNECA, etc.). The ultimate aims of these exchanges, which would be facilitated by fellowships granted by Unesco and other international organizations and would be supported by the services of consultants, should be the progressive integration of curricula within a given area, the compilation of information, the creation of "banks" of audio-visual media, the publication of material for distribution to a wider market, etc.

(xv) The Seminar strongly recommends that Unesco take action as rapidly as possible to distribute the results of the Pilot Project at international level in the form of a detailed report, for this will be an important contribution to biology teaching in general and will involve the investment of considerable funds. It appears most desirable that these results be brought to the attention of the Secretary-General of the United Nations Conference on the Human Environment, to be held in June 1972 in Stockholm, which is concerned about the educational aspects of the subject in the developing countries.

(xvi) The Seminar recommends the establishment of a permanent regional commission for biology teaching, in order to meet the needs of the African countries. Such a commission should be composed of teachers and would be expected to co-operate closely with the Education Commission of IUCN.

The participants in the Seminar wished to express their sincere gratitude to their Ugandan colleagues for the hospitality they had offered to the Seminar, thus providing an opportunity for exchanges of views and for the preparation of useful and important recommendations for the improvement of biology teaching.

ANNEX 1

AGENDA

Wednesday, 5 January

10.00 a.m.		Opening ceremony by the Hon. E.B. Rugumayo, Minister of Education
11.00 a.m.		Administrative questions
11.30 a.m.		Election of Chairman and Secretary
12.00 p.m.		Adoption of Agenda and of procedures
2.05 p.m.	1.	Relations between teacher and research scientist in Africa
3.15 p.m.	2.	Place and rôle of biology in the curriculum, biology teaching and environment and conservation projects, biology teaching versus integrated science teaching
7.30-9.00 p.m.		Reception in honour of delegates

Thursday, 6 January

9.05 a.m.	3.	Local personnel involved in innovation, effective methods of education, in-service training and permanent information for teachers
10.30 a.m.	4.	Diffusion, implementation and local use of materials produced by Unesco Pilot Project
2.05 p.m.	5.	Effect of Unesco Pilot Project upon country curricula, production of local editions, initiation of new regional and country projects
3.25 p.m.	6.	How to avoid dogmatic teaching in the areas difficult for classroom experiments

Friday, 7 January

9.05 a.m.	7.	Place of textbooks and workbooks in biology courses, contribution of audio-visual methods
10.35 a.m.	8.	Use of living material and of field work in school practice
2.05 p.m.	9.	Evaluation of effectiveness of new courses and curricula

Saturday morning to Sunday evening (8 and 9 January 1972)

Visit to Queen Elizabeth National Park

Monday, 10 January

9.05 a.m. and 2.05 p.m.	10.	Future activities and arrangements for collaboration between the African countries for the improvement of biology teaching; means of assisting the national study groups

Tuesday, 11 January

9.05 a.m.	Presentation and adoption of reports on the items discussed by the Seminar
2.05 p.m.	Adoption of recommendations of the Seminar
4.00 p.m.	Closing session, presided by Professor Banage, Minister of Animal Industry, Fisheries and Game

ANNEXE 2

LISTE DES PARTICIPANTS/LIST OF PARTICIPANTS

1. Mr. Michel Atchia
Queen Elisabeth College,
Rose Hill
Mauritius

2. Sister Maria Bevans
Saint Joseph's Mission
P.O. Box 13
Gaberones
Botswana

3. M. le professeur Henri Camefort
Laboratoire de botanique
Ecole normale supérieure
24, rue Lhomond
Paris, 5e

4. Dr. Andrzej Grebecki
Division of Science Teaching, SCT,
Unesco
Place de Fontenoy
Paris, 7e

5. M. S.L. Gueye
Ecole normale supérieure
Bd Bourguiba
Dakar-Fann
Sénégal

6. M. le professeur René Heller
Laboratoire de physiologie végétale
1, rue Victor Cousin
Paris, 5e

7. M. Dominique Kasirye
National Institute of Education
P.O. Box 7062
Kampala
Uganda

8. Dr. P. Kelly
Nuffield Science Teaching Project
Chelsea College
University of London
Pulton Place
London, S.W. 6

9. Mr. Joseph Kimura
Secretary
Biology Panel
Kenya Institute of Education
P.O. Box 30426
Nairobi
Kenya

10. Mr. Albert Meena
Secretary, Tanzania Biology Panel
Institute of Education
University of Dar es-Salaam
P.O. Box 35094
Dar es-Salaam
Tanzania

11. Dr. G.R. Meyer
Director
School of Education
Centre for Advancement of Teaching
Macquarie University
North Ryde
New South Wales 2113
Australia

12. Mr. E. Mohapi
Science Education Officer
Ministry of Education
P.O. Box 47
Maseru
Lesotho

13. Dr. Denys Morgan
University of Zambia
P.O. Box 2379
Lusaka
Zambia

14. Mr. Stan Moss
Ministry of Education
P.O. Limbe
Malawi

15. Dr. Reuben J. Olembo
Department of Botany
University College of Nairobi
Nairobi
Kenya

16. M. Sylvère Rakotofiringa
Institut pédagogique
B.P. 3169
Tananarive
Madagascar

17. Dr. M. Saber Selim
12, Mohamad Talaat Street
Agouza
Dokki
Cairo
Egypt

18. Dr. Dan Saint Rossy
Unesco Field Science Office for Africa
P.O. Box 30592
Nairobi
Kenya

19. M. le professeur Albert Sasson
Faculté des sciences
Université Mohammed V
Avenue Moulay Chérif
Rabat
Maroc

20. M. le professeur Adolphe Soppo N'Dongo
Ecole normale supérieure
Université fédérale du Cameroun
B. P. 47
Yaoundé
Cameroun

21. M. Tahirou Traoré
Lycée de Sévaré
Bamako
Mali

22. Mr. J.M. Watson
Science Adviser
c/o British Council
P.O. Box 1043
Addis Ababa
Ethiopia

23. M. Paul Viard
Ecole supérieure de pédagogie
Vientiane
Laos

ANNEX 3 - COMPARATIVE STUDY OF THE BIOLOGY PROGRAMMES OF DIFFERENT AFRICAN COUNTRIES

Age (years)	COUNTRY							
	Mali	Cameroon Dahomey, Ivory Coast, Madagascar, Niger, Togo, Upper Volta	Cameroon Experimental Programme	Zaire	Morocco	Ghana, Kenya, Malawi, Mauritius, Nigeria, Sierra Leone, Tanzania, Uganda, Zambia	Egypt	Botswana
6	**6-11** First cycle of fundamental education. Topic teaching of biological interest	**6-11** Primary education	**6-11** Primary education	**6-11** Primary education	Primary education. Part of the syllabus is compulsory; the rest of the time is left to the teacher's discretion. (the open portion)	Primary education. **5-11** Health science or Introduction to the science or Topic teaching of biological interest or integrated primary science	**6-11** Primary education. Integrated science, including health, science and agriculture	**5-11** Primary education. Integrated primary science and agriculture
7								
8								
9								
10								
11					**11-13** 1st cycle of second.: Man. Organs, their functions and hygiene. 5 examples of animals are studied + open portion. Botany and geology. Landscape and rock + open portion			
12	**12-14** 2nd cycle: botany, zoology, geology, human anatomy and physiology, microbiology and hygiene	**12-15** 1st cycle of second. school. Botany and zoology at 12 and 13	**12-16** 1st cycle of second. school. Vertebrates, flowering, plants	**12-17** Human anatomy, botany, zoology		**12-13** Lower forms, sec. school: general science including biology or integrated science	Secondary school. **12-14** Intermediate biology is taught as part of integrated science	**12-16** Secondary school: **12-14** Introductory science and agriculture
13			Invertebrates. Plants and their environment	No biology				
14		Geology	Human anatomy and physiology, hygiene, genetics	Microbiology, hygiene	Biology: Ecology, Study of animals and plant types, geology	**14-16** Middle forms, secondary school. Biology taught as a separate subject.		
15	**15-18** Secondary school: Three specialized streams: (a) Exact sciences (b) Biological sciences (c) Arts. All three study biology, ecology, physiology and geology	Human anatomy, physiology, microbiology and hygiene	Social medicine and first-aid	No biology	Geology and soil study. Nutrition in man and plants. Cycle in nature	All aspects of biology: Ecology, physiology of man, other animals and plants, morphology	**15-17** Upper secondary school. Biology is taught throughout as a separate subject	**15-16** Biology, physical science and agricultural sciences
16		**16-18** 2nd cycle. at 16: no biology	Geology	Cytology and cellular physiology	Human biology, reproduction, genetics, origin and evolution of Man			
17		At 17: Ecology, geology physiology, cellular bio.	**17-18** 2nd cycle: Cytology, biochemistry, physiology	Genetics evolution		**17-18** Sixth form biology: Anatomy, physiology, genetics, evolution, economic biology, morphology, comparative studies		
18		At 18: Physiology, reproduction, genetics, evolution						

Note: The thick lines represent boundaries between different levels of schooling (i.e. between primary and secondary; between first and second cycles; between the first five years of secondary school and sixth form). These data were compiled from personal contributions of people at the Kampala seminar; the views expressed do not represent the official position of the countries concerned.